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FINAL
ENVIRONMENTAL IMPACT STATEMENT

USDA-SCS-ES-WS-(ADM)-74-16-(F)

RED DEER CREEK
WATERSHED PROJECT

GRAY, ROBERTS, and HEMPHILL COUNTIES, TEXAS



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	Page
SUMMARY	1
SPONSORING LOCAL ORGANIZATION	1
PROJECT OBJECTIVES AND SCOPE	1
PLANNED PROJECT	2
Land Treatment Measures	2
Structural Measures	2
Operation and Maintenance	7
Project Costs	9
ENVIRONMENTAL SETTING	10
Physical Resources	10
Economic Data	15
Fish and Wildlife Resources	16
Recreational Resources	17
Archeological and Historical Resources	17
Soil, Water, and Plant Resources	21
Projects of Other Agencies	22
WATER AND RELATED LAND RESOURCE PROBLEMS	22
Land and Water Management	22
Floodwater and Sediment Damages	23
Erosion Damage	26
Indirect Damage	27
Irrigation	27
Municipal and Industrial Water	28
Recreation	28
Fish and Wildlife	28
Economic and Social	29
Other	29
RELATIONSHIP TO LAND USE PLANS, POLICIES, AND CONTROLS	29
ENVIRONMENTAL IMPACT	30
Flood Prevention, Erosion, and Sediment	30
Fish and Wildlife and Recreation	33
Archeological, Historic, and Scientific	34
Economic and Social	36
Other	36
FAVORABLE ENVIRONMENTAL EFFECTS	37
ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED	39
ALTERNATIVES	39
SHORT-TERM VS. LONG-TERM USE OF RESOURCES	41
IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES	43
CONSULTATION WITH APPROPRIATE FEDERAL AGENCIES AND REVIEW BY STATE AND LOCAL AGENCIES DEVELOPING AND ENFORCING ENVIRONMENTAL STANDARDS	43
General	43
Discussion and Disposition of Each Comment on Draft Environmental Impact Statement	44
LIST OF APPENDIXES	
Appendix A - Comparison of Benefits and Costs for Structural Measures	
Appendix B - Project Map	
Appendix C - Letters of Comment Received on the Draft Environmental Impact Statement	
Appendix D - Urban Area, Miami, Texas	
Appendix E - Urban Area, Canadian, Texas	

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USDA-SCS-EIS-WS-(ADM)-74-16-(F)

Red Deer Creek Watershed
Gray, Roberts, and Hemphill Counties, Texas

ENVIRONMENTAL IMPACT STATEMENT

Edward E. Thomas, State Conservationist
Soil Conservation Service

U. S. DEPT. OF AGRICULTURE
NATIONAL ARCHIVES
AUG 17 1976
CATALOGING - RMLP

Sponsoring Local Organizations:

Gray County Soil and Water Conservation District
Star Route 3, Box 62, Pampa, Texas 79065

Roberts Soil and Water Conservation District
Route 1, Box 38, Pampa, Texas 79065

Hemphill County Soil and Water Conservation District
Route 1, Higgins, Texas 79046

Gray County Commissioners Court
Pampa, Texas 79065

Roberts County Commissioners Court
Miami, Texas 79059

Hemphill County Commissioners Court
Canadian, Texas 79014

April 1975

PREPARED BY

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
Temple, Texas

USDA ENVIRONMENTAL IMPACT STATEMENT

Red Deer Creek Watershed Project
Gray, Hemphill, and Roberts Counties
Texas

Prepared in Accordance with Sec. 102(2)(C) of P.L. 91-190

Summary

- I. Final
- II. Soil Conservation Service
- III. Administrative
- IV. Description of Action: This is a watershed project to be carried out by the sponsoring local organizations with federal assistance under the authority of Public Law 566. The project, located in portions of Gray, Hemphill, and Roberts Counties, proposes land treatment measures within the watershed on about 39,010 acres of grassland and cropland and 20 floodwater retarding structures to be constructed during a 10-year installation period.
- V. Summary of Environmental Impact and Adverse Environmental Effects: Project action will: protect watershed lands from erosion and maintain or increase productivity; increase efficiency of use of irrigation water; reduce flooding of the transportation system, agricultural lands, and urban properties in Miami and Canadian; reduce deposition of sediment on the flood plain and volume of sediment contributed to the Canadian River; reduce streambank erosion; provide incidental ground water recharge for irrigation and spring flow; create surface water for waterfowl and fishery resource; improve wildlife habitat on flood plain and for the threatened lesser prairie chicken on the rangeland; create opportunities for additional employment and income to households; increase demand for goods and services; cause temporary destruction of vegetation on 230 acres of land needed for construction; require changed land use on 466 acres of land; occasionally interrupt use on 2,079 acres of land; initially reduce runoff at the Canadian River; destroy 17 archeological sites, and require precautionary action to prevent destruction of 8 additional archeological sites and one paleontological site.
- VI. List of Alternatives Considered: (1) An accelerated program of applying land treatment measures, relocating improvements out of the flood hazard area, and restricting new construction in the flood hazard areas; and (2) foregoing the implementation of a project.

VII. Agencies From Which Comments Have Been Received:

U. S. Department of the Army
U. S. Department of Commerce
U. S. Department of Health, Education, and Welfare
U. S. Department of the Interior
U. S. Department of Transportation
Advisory Council on Historic Preservation
Environmental Protection Agency
Federal Power Commission
Division of Planning Coordination (state agency designated
by Governor and state clearinghouse)
Panhandle Regional Planning Commission (regional clearinghouse)

VIII. Draft statement transmitted to CEQ on November 16, 1973.

USDA SOIL CONSERVATION SERVICE

ENVIRONMENTAL IMPACT STATEMENT

for

RED DEER CREEK WATERSHED

Gray, Hemphill, and Roberts Counties, Texas

Installation of this project constitutes an administrative action. Federal assistance will be provided under authority of Public Law 83-566, 83rd Congress, 68 Stat. 666, as amended.

SPONSORING LOCAL ORGANIZATIONS

Gray County Soil and Water Conservation District
Roberts Soil and Water Conservation District
Hemphill County Soil and Water Conservation District
Gray County Commissioners Court
Roberts County Commissioners Court
Hemphill County Commissioners Court

PROJECT PURPOSES AND GOALS

Meetings were held with the sponsors to discuss their problems, possible solutions, watershed resource development needs, and the formulation of project objectives. Initially, the sponsors' objectives were:

1. Immediate establishment and maintenance of approximately 80 percent of the land treatment measures which contribute directly to the conservation, development, and productive use of the soil, water, and related resources.
2. Provision of a level of protection which would reduce floodwater and sediment damages on the agricultural land by 65 to 70 percent, and which would provide flood protection in the developed areas of Miami.
3. Develop surface water supply for the city of Canadian.
4. Preservation and improvement of fish and wildlife resources.
5. Stimulation of the economic development of the area as the result of project installation.

The sponsors considered the impacts, both favorable and adverse, in developing the plan for meeting the project objectives. The objectives selected were those that would contribute to the conservation, development, and productive use of the watershed's soil, water, and related resources so that the watershed residents can enjoy:

- QUALITY IN THE NATURAL RESOURCE BASE FOR SUSTAINED USE
- QUALITY IN THE ENVIRONMENT TO PROVIDE ATTRACTIVE, CONVENIENT, AND SATISFYING PLACES TO LIVE, WORK, AND PLAY
- QUALITY IN THE STANDARD OF LIVING BASED ON COMMUNITY IMPROVEMENT AND ADEQUATE INCOME

The sponsors selected measures which would help to achieve those objectives and also included measures to minimize adverse impacts wherever practicable.

The project, as formulated, meets four of the project objectives. Studies indicated that a dependable water supply for the city of Canadian could not be developed at any of the sites because of low runoff and high seepage and evaporation losses.

PLANNED PROJECT

The project measures to be installed in order to achieve the sponsors' objectives consist of a combination of conservation land treatment measures and structural measures. The objectives of the land treatment phase are the use of each acre within its capabilities and the treatment of each acre in accordance with its needs. The structural measures will be installed to provide flood protection to the flood plain lands.

Land Treatment Measures

Conservation land treatment measures will be applied on about 11,480 acres of cropland, 26,850 acres of rangeland, and 680 acres of pastureland during a 10-year installation period. These measures will be applied in addition to maintaining those measures already applied in order to achieve effective treatment on about 80 percent of the land in the watershed. Land treatment measures planned for the watershed are those that will contribute directly to the preservation and enhancement of the environment in the watershed. Emphasis will be given to those measures which will reduce soil and water losses, assure proper functioning of the structural measures, reduce flooding, and preserve and improve the fish and wildlife resources of the watershed.

Conservation measures which landowners and operators will be encouraged to install on the cropland include conservation cropping system, contour farming, crop residue management, grassed waterways, and diversions for protection and improvement of the dryland cropland, as well as the irrigated cropland. Water-saving measures to be applied on the irrigated cropland include irrigation land leveling, irrigation pipelines, irrigation systems, and irrigation water management. Conservation cropping systems primarily include small grains,

grain sorghums, and some alfalfa in rotation. Conservation measures to be applied on pasture and rangeland include pasture and hayland planting and its proper management, range seeding, deferred grazing, and proper grazing use. Invading mesquite and sand sage will be controlled on native grassland areas. Ranch operators who plan to control invading brush will be encouraged to accomplish this in a manner which will be compatible with the needs of wildlife for food and cover. Approximately 9,000 acres of the 12,000 acres infested with mesquite are expected to be treated by mechanical means. Most of the 1,200 acres of saltcedar, willow, and baccharis will be controlled by mowing. Very little control is expected on yucca; however, about 7,500 acres of the 15,000 acres of sand sagebrush will be controlled by chemical means. Where technical assistance is provided by the Soil Conservation Service, chemical control will be by use of chemical agents approved fully and registered for the intended use at the time of application. Ponds will be constructed on rangeland to enable operators to defer grazing and use rangeland properly. The ponds will also provide watering spots for wildlife. Landowners will be encouraged to install forest management practices, such as tree plantings of drought-hardy loblolly pine and other appropriate tree species, on gullied lands for erosion control, wildlife habitat enhancement, windbreaks, fenceposts, etc. The Texas Forest Service will assist landowners in planning forestry management practices.

Land treatment measures which landowners and operators will be encouraged to apply as secondary treatment, primarily for the benefit of fish and wildlife resources in the watershed, include wildlife upland habitat management on about 84,000 acres and fishpond management on about 90 ponds. Wildlife upland habitat management practices will include planned brush management for controlling brush in strips and patterns by leaving not less than 30 percent of the rangeland in woody species compatible with the terrain features for the needs of wildlife species. Mechanical brush management practices will provide the soil disturbance necessary to promote the growth of forbs such as crotons, ragweeds, and sunflowers, furnishing excellent food and cover for birds and small mammals. Woody species such as plum, hackberry, bumelia, and cottonwood will be preserved. Landowners will be encouraged to fence and plant 5- to 10-acre plots of small grains such as oats, wheat, and barley for winter grazing for deer and turkeys and feed grain production for birds in the spring and summer. Wildlife populations in the watershed are not dense enough to require supplemental feeding. Domestic watering facilities such as ponds and troughs provide adequate watering facilities for the wildlife throughout the watershed. Fishpond management includes stocking with adapted species of fish, aquatic weed control, and pond fertilization. Landowners will be encouraged to plant locust and eastern redcedar trees on gullied areas to help stabilize such areas and also provide cover for wildlife.

Structural Measures

A system of 20 floodwater retarding structures will be installed to provide protection to the flood plain lands of the watershed. The location of the planned structural measures is shown on the project map (Appendix B).

Runoff from 65 percent of the watershed will be retarded by the structural measures.

The total floodwater retarding capacity in the floodwater retarding structures is 30,349 acre-feet. This storage, combined with the principal spillway capacity for all structures, will provide protection to the emergency spillways. All emergency spillways of the structures will have less than 4 percent chance of use at the end of their design life. The emergency spillways will be open channels excavated in earth and will be vegetated for protection from erosion.

The total capacity allocated for the expected 100-year accumulation of sediment is 10,432 acre-feet. The principal spillway crest of all the structures will be set at the 100-year sediment capacity. The principal spillways for structures Nos. 1, 4, 5, 6, and 8 through 20 will be ported at the elevation which will limit impoundments to 200 acre-feet including borrow. As requested by the sponsors, floodwater retarding structure No. 2 will be designed for a dry sediment pool and there will be no planned impoundment of water in the reservoir. All principal spillways will be the drop inlet type with cantilever outlets. All of the structures will have provisions to release impounded floodwater in order to perform maintenance, and if it becomes necessary, to avoid encroachment upon prior downstream water rights. The maximum height of the structures will range from 35 feet to 86 feet. The surface areas of the pools at the lowest ungated outlets will range from zero to 34 acres. The surface areas of the retarding pools will range from 18 to 413 acres.

All of the structure sites are located in poorly consolidated rock of the Ogallala Formation. Yielding foundations occur at all sites. Foundation drainage measures will be required at most sites because of permeable materials. Slowly permeable foundation materials occur at the sites of floodwater retarding structures Nos. 1, 2, 3, and 4. Borrow materials are classified mainly as SM, SP, SC, ML, and CL under the Unified Soil Classification System.

The following alterations, modifications, or replacements will be necessary in order to install the floodwater retarding structures:

Floodwater Retarding
Structure Number

Item

1	Pipeline
2	Railway embankment
14	County road
17	Powerline
19	Pipeline

It will be necessary to protect the embankment of the railway from potential damage by impounded floodwater.

Engineering surveys of the pool areas and structure sites disclosed the presence of only one abandoned oil well. This well is located in the floodwater retarding pool area of structure No. 13, and it has been registered with the Texas Railroad Commission (the responsible state agency) as being properly plugged. A further check with landowners and the Texas Railroad Commission failed to disclose the presence of any abandoned wells at any of the other structure sites.

Preliminary investigations indicate that under present conditions installation of the structural measures will not cause the displacement or relocation of any dwelling, business, or farming operations.

Installation of the structural measures will require 2,775 acres of land, which includes 2,467 acres of rangeland and 308 acres (38 miles) of dry streambeds. The construction of the dams and emergency spillways will require about 230 acres of rangeland. The sediment pools at the lowest ungated outlets will inundate 466 acres of land, including 337 acres of rangeland and 129 acres (15 miles) of dry streambeds. The retarding pools will require 2,079 acres of land, including 1,900 acres of rangeland and 179 acres (23 miles) of dry streambed for temporary impoundment of floodwater. All needed borrow for the embankments can be obtained from the emergency spillway areas and from within the sediment pool areas.

The areas needed for construction of the dam and emergency spillway and the borrow areas will be cleared of all existing vegetation. In addition, any large woody vegetation in the sediment pool which might interfere with the operation of the outlet works of the structure will also be cleared. The dams, emergency spillways, and areas disturbed during construction, except for water impoundment areas, will be planted with multi-use plants for erosion control, wildlife use and grazing of livestock.

The environment will be protected from soil erosion and water and air pollution during construction. Contractors will be required to adhere to strict guidelines set forth in each construction contract to minimize soil erosion and water and air pollution during construction. Excavation and construction operations will be scheduled and controlled to prevent exposure of extraneous amounts of unprotected soil

to erosion and the resulting translocation of sediment. Measures to control erosion will be uniquely specified at each work site and will include, as applicable, use of temporary vegetation or mulches, diversions, mechanical retardation of runoff, and traps. Motors of construction equipment will be required to have mufflers to reduce noise. Harmful dust and other pollutants inherent to the construction process will be held to minimum practical limits. Haul roads and excavation areas and other work sites will be sprinkled with water as needed to keep dust within tolerable limits. Contract specifications will require that fuel, lubricants, and chemicals be adequately labeled and stored safely in protected areas, and disposal at work sites will be by approved methods and procedures. Clearing and disposal of brush and vegetation will be carried out in accordance with applicable laws, ordinances, and regulations in respect to burning. Each contract will set forth specific stipulations to prevent uncontrolled grass or brush fires. Disposal of brush and vegetation will be by burying, hauling to approved off-site locations, or controlled burning, as applicable.

Stringent requirements for safety and health in conformance with the Construction Safety Act will be included in each construction contract.

Necessary sanitary facilities, including garbage disposal facilities, will be located to prohibit such facilities being injuriously adjacent to live streams, wells, or springs in conformance with federal, state, and local water pollution control regulations. Conformance to all environmental control requirements will be monitored constantly by a construction inspector who will be on-site during all periods of construction operation.

The environment will continue to be protected from erosion and water pollution following completion of construction. Project sponsors will operate and maintain the structural measures in accordance with a specific operation and maintenance agreement. The agreement will set forth the inspections to be made and the maintenance to be performed to prevent soil erosion and water pollution. Sponsors have given assurance that adequate sanitary facilities meeting local and state health standards will be provided at reservoirs prior to any recreational use.

All applicable state water laws will be complied with in the design and construction of the structural measures, as well as those pertaining to the storage, maintenance of quality, and use of water.

The sediment pools of most of the floodwater retarding structures are not expected to hold water permanently. Only the sediment pools at floodwater retarding structure sites Nos. 1, 3, 4, and 11 are expected to hold water year-round during years of average and above average rainfall. These pools and surrounding areas would have good potential for incidental recreational use. The sponsors do not plan to provide public

access to any of the structural measures and will discourage landowners from using any water created by the project for incidental recreation until sanitary facilities meeting local and state health requirements are met. The sponsoring local organizations and the Soil Conservation Service will, however, encourage landowners having particularly well-adapted sites to develop income-producing recreation facilities that meet local and state health standards.

Investigations by the Archeological Research Laboratory, Killgore Research Center, West Texas State University, under the direction of Dr. Jack T. Hughes, indicate that archeological information exists at or near 15 of the 20 planned floodwater retarding structures. A detailed study of all archeologic resources in the watershed is being made but the final report has not been completed. An interim report has been prepared by Dr. Hughes and associates for use in preparation of the work plan and environmental impact statement. This interim report made the following recommendations for further investigations and study:

Prior to dam construction, most of the above sites will require additional investigation, ranging from limited testing to extensive excavation. Specific recommendations as to salvage measures needed to mitigate the impact of construction on each site must await evaluation of each site in the total context of our archeological, historical, and paleontological knowledge of the watershed.

The time and money budgeted for the work should be sufficiently flexible to allow for unexpected discoveries at the known sites, and for the discovery of new sites, during the salvage process.

Dr. Hughes estimates that about \$40,000 will be needed for an adequate archeological salvage program.

In compliance with Public Law 86-523, the Secretary of the Interior, through the Director, Southwest Region, National Park Service, will be kept informed of the construction schedule so that the Secretary can initiate whatever salvage or preservation of archeological resources is deemed necessary.

Operation and Maintenance

Land treatment measures will be maintained by the land users and operators of farms and ranches on which the measures are installed under agreements with the Gray County, the Roberts, and the Hemphill County Soil and Water Conservation Districts. The districts will encourage land users to maintain the land treatment measures.

The structural measures will be operated and maintained by the Commissioners Courts of Gray, Roberts, and Hemphill Counties. The accomplishment and financing will be the responsibility of the county in which the structural measures are located. Funds for this purpose will come from the general fund of the county. The general fund of each county is supported by existing taxes and is available and adequate for this purpose.

Gray County Commissioners Court will be responsible for floodwater retarding structures Nos. 1, 2, 3, 4, 6, and 7.

Roberts County Commissioners Court will be responsible for floodwater retarding structures Nos. 5, 8, 9, 10, 11, 12, 13, 14, 15, and 16.

Hemphill County Commissioners Court will be responsible for floodwater retarding structures Nos. 17, 18, 19, and 20.

The estimated average annual cost of operation and maintenance is based on current (1974) prices. This consists of \$1,350, \$1,700, and \$800, respectively, for the floodwater retarding structures located in Gray, Roberts, and Hemphill Counties.

Immediately following completion of the structures by the contractor, the appropriate counties will be responsible for and promptly perform or have performed, without cost to the Service, all maintenance of the structural measures as determined to be needed by either the sponsors or the Service. The counties will be responsible for maintenance of vegetation associated with structural measures after the initial vegetation work is adequately completed, as determined by the Service, but no later than three years following completion of each structural measure.

The sponsors will make an inspection of the structural measures annually and after unusually severe floods or other events of nature that may adversely affect the structures. The Service will participate in the inspections for the first three years following installation of each structure and as often as it elects to do so after the third year. Inspection items are those items which may need maintenance. Items of inspection and maintenance will include, but will not be limited to, vegetative cover, fences, gates, and vegetative growth in reservoirs. Also, the structures will be monitored to determine that there are no water pollution problems being created by livestock watering, etc.

Sponsors will control the handling, storage, and application of herbicides and pesticides that may be necessary for operation and maintenance of the structural measures. Only approved and authorized reagents and compounds will be used. These applications will be compatible with current laws regulating their use. In

addition to sound and prudent judgment, ordinances and standards concerned with the disposal or storage of unused chemicals, empty containers, contaminated paraphernalia, etc., will be observed and applied.

Provisions will be for free access of representatives of the sponsoring local organizations and of Soil Conservation Service representatives to inspect and provide for maintenance of all structural measures and their appurtenances at any time.

The counties will prepare a report of all maintenance inspections. A copy of this report will be submitted to the Service representative. The counties will keep summary control records in support of proper maintenance having been performed on these works of improvement.

An operation and maintenance agreement will be executed by the parties hereto prior to the signing of the initial project agreement and the issuance of invitations to bid on construction of the structural measures. The agreement will set forth specific details on procedure in line with recognized assignments of responsibility and will be in accordance with the Texas Watersheds Operation and Maintenance Handbook. An operation and maintenance plan will be prepared for each structural measure. The operation and maintenance agreement will include specific provisions for retention and disposal of property acquired or improved with PL 566 financial assistance.

Project Costs

The estimated costs for installation of the project are presented in the following tabulation:

: Estimated Cost (Dollars) ^{1/}			
: PL-566 : Other :			
: Funds : Funds :			
: Non-Federal Land: Non-Federal Land:			
Installation Cost Item	: SCS2/	: SCS2/	: Total
<u>Land Treatment^{3/}</u>			
Installation	-	526,490	526,490
Technical Assistance	127,900	114,700	242,600
Subtotal	127,900	641,190	769,090
<u>Structural Measures</u>			
Construction	2,049,800	-	2,049,800
Engineering Services	131,310	-	131,310
Project Administration	348,470	10,000	358,470
Land Rights (including water rights)	-	156,950	156,950
Subtotal	2,529,580	166,950	2,696,530
TOTAL PROJECT	2,657,480	808,140	3,564,620

^{1/} Price Base: 1974

^{2/} Federal agency responsible for assisting in installation of works of improvement.

^{3/} Includes only areas estimated to be adequately treated during the project installation period. Treatment will be accelerated throughout the watershed, and dollar amounts apply to total land areas, not just to adequately treated areas.

The ratio of the average annual benefits to the average annual cost is given in Appendix A.

ENVIRONMENTAL SETTING

Physical Resources

Red Deer Creek watershed project comprises an area of 211,840 acres, or 331 square miles in the northeastern part of the Panhandle of

Texas. The watershed is long and narrow. The total length is approximately 50 miles with a maximum width near the center of about 10 miles. It drains portions of northeastern Gray, southeastern Roberts, and western Hemphill Counties, Texas.

Three urban areas lie within the watershed. Pampa, population 21,726, lies near the headwaters of Red Deer Creek; Miami, population 611, lies in the central part near Red Deer Creek; and Canadian, population 2,292, lies near the confluence of Red Deer Creek with the Canadian River. The metropolitan center of Amarillo, population 127,010, lies about 60 miles to the west of the project area.

The watershed lies within the Arkansas-White-Red Water Resource Region. Red Deer Creek is a tributary of the Canadian River and enters the river about 25 miles upstream from the Texas-Oklahoma state line and about 400 miles upstream of the Eufaula Reservoir, the first major downstream reservoir. Lake Meredith, a large municipal and industrial water supply reservoir, lies about 70 miles upstream on the Canadian River.

Floodwater and sediment damages occur on about 8,090 acres of flood plain within the watershed and contribute to damages on the Canadian River. Large floods occurring on an average of about every 4 years and small floods occurring on an annual basis deposit an average of 450,000 tons of highly damaging sandy sediment on the flood plain soils each year. These materials are derived from the highly erosive, geologically unstable uplands and are damaging 6,720 acres of flood plain soils. Sediment accumulating in the channels and on the flood plain has increased flooding and damages on the flood plain and is encroaching upon the physical improvements on and bordering the flood plain.

Two diverse physiographic areas, the High Plains area and the Red Canyon area, occur within the watershed. The topography ranges from nearly flat on the High Plains area to a steeply rolling, Badlands-like, canyon country in the Red Canyon area. The High Plains area covers about 30 percent of the watershed. It is a remnant of a featureless, slightly eastward sloping plain which was deposited over this region during Pliocene times. The Red Deer Creek valley incises this plain from the east, leaving the flat surfaced plain intact from the vicinity of Pampa eastward to points on the watershed divides lying to the north and south of Miami. The canyon type topography of the Red Canyon begins abruptly at the edge of the High Plains and occurs throughout most of the remainder of the watershed. Nearly level flood plain lands, ranging from 250 feet wide upstream from Hoover to more than 2,600 feet wide in the lower reaches, occur along the mainstem of Red Deer Creek. Elevations range from 2,330 feet above mean sea level on the flood plain near Canadian to 3,300 feet on the High Plains west of Pampa.

The watershed is underlain by highly variable sedimentary materials of the Ogallala Formation of Tertiary (Pliocene) age. This formation consists mainly of outwash materials which occur in beds, lenses, and old channel deposits. The lithology varies within short distances, both horizontally and vertically, and consists of clay, silt, fine to coarse sand, gravel, and caliche. The materials are mostly poorly consolidated with some scarp-forming (calcium carbonate) cemented beds. The plateau-like High Plains is blanketed by fine-grained, wind-deposited materials of Pleistocene age. Scattered shallow depressions and intermittent lakes containing Recent deposits of dense clay dot the flat surface. Pleistocene age stream terraces and Recent age alluvial deposits occur along Red Deer Creek.

Soils of the Southern High Plains Land Resource Area (High Plains Physiographic Area) comprise 30 percent of the watershed and those of the Central Rolling Red Plains Land Resource Area (Red Canyon Physiographic Area) constitute the remaining 70 percent. These land resource areas will hereinafter be referred to as High Plains and Rolling Red Plains, respectively.

The Pullman series is the dominant soil in the High Plains. Small areas of the Randall series occur in shallow depressions and intermittent lakes. The deep, productive Pullman and other related soils, except the Randall soils, are used extensively for both dryland and irrigated crop production. The Randall soils are used mainly for forage crops and native pasture.

Soils of the Mansker, Potter, Mobeetie, and other associated series predominate in the upland portion of the Rolling Red Plains. These soils, which occur mainly on steeply rolling and rough lands, are used exclusively for rangeland. Active gully and Badlands-like erosion in some of these soils contributes heavy loads of sediment to streamflows. The sandy upland soils are mainly of the Tivoli series and are used for rangeland. Some bare sand dunes occur in association with the Tivoli soils. About 10 percent of this land resource area consists of nearly level flood plain, stream terrace, and hummocky sandy soils. Soils of the flood plain include the sandy Lincoln soils, and the loamy Guadalupe and Spur series. These flood plain soils are used as native grass meadowland for both hay production and grazing.

Average annual rainfall varies from 20 to 23 inches, depending upon location within the watershed. About 70 percent of the average annual rainfall is received during the months of April through September. The balance is fairly well distributed over the remaining months of the year. The average date of the last killing frost in the spring is April 12 and that of the first killing frost in the fall is October 30, resulting in an average growing season of 200 days.

Mineral resources in the watershed include oil and gas production from five separate fields (figure 5), sand and gravel obtained from both the Ogallala Formation and the streambed of Red Deer Creek, and caliche materials obtained from scattered areas of the Ogallala Formation. Oil and gas production in the Gray County portion occurs from the large Panhandle Oil and Gas Field lying southwest of Pampa and the very small Hoover Northeast Gas Field. Production in the Roberts County area is from the Quinduno Oil Field, the Red Deer Gas Field, and the Mendota Northwest Gas Field, which lies in both Roberts and Hemphill Counties. Petroleum exploration and activity are continuing over much of the watershed area.

The Ogallala Formation is the main ground water aquifer for the area and is used extensively for irrigation and other purposes. It is also the source of spring flow in Red Deer Creek. The dissolved solids concentration varies from about 300 parts per million to slightly over 600 p.p.m. The higher concentrations occur in wells located near the large Panhandle Oil and Gas Field.

The over-all land use in the watershed is as follows:

<u>Land Use</u>	<u>Acres</u>	<u>Percent</u>
Cropland	45,804	21.6
Pastureland	768	0.4
Rangeland	152,093	71.8
Urban and Built-Up	8,533	4.0
Other <u>1/</u>	<u>4,642</u>	<u>2.2</u>
Total	211,840	100.0

1/ Includes farmsteads, roads, railroads, etc.

Most of the cropland is on the nearly flat soils of the High Plains area. These soils are well suited for the use of the cultural practices needed for a successful dryland agriculture as well as for an irrigated agriculture. Only minor changes in land use are occurring in this area. There is a slight increase in pastureland and in cropland being irrigated.

The steeply rolling canyon lands of the Rolling Red Plains area are unsuited for cultivation and are used exclusively for rangeland. The urban buildup of Pampa, which is dominated by an economy based on petroleum production and associated industries, is slow.

The native vegetation of the watershed consists of mixed short, mid, and tall grasses with inclusions of forbs and woody plants. The present composition of the plant community depends upon the past history of grazing and management.

The plant community under good to excellent range conditions includes the following plants. The short grasses, buffalograss, vine-mesquite, and blue grama, predominate on the clayey soils. Mid grasses, including sideoats grama, western wheatgrass, and sand dropseed, occur on the shallow soils. The tall grasses, including little bluestem, sand bluestem, indiagrass, switchgrass, prairie cordgrass, eastern gamagrass, tall dropseed, alkali sacaton, and Canada wildrye occur on the deep sandy soils, roughlands, bottomlands, and subirrigated flood plain soils. Forbs such as wild alfalfa, prairie clover, catclaw sensitivebrier, dotted gayfeather, engelmannndaisy, dalea, plains actinea, and black samson are found in association with the grasses. Existing woody plants are yucca and mesquite on the clay soils; skunkbush, catclaw acacia, sand plum, and sagebrush on the sandy soils; mountain mahogany, juniper, sumac, and hopbush on the roughlands and shallow soils; and cottonwood, saltcedar, willow, baccharis, and hackberry on the flood plain soils.

As the condition of the rangeland changes from excellent to poor, grasses such as threeawn, red lovegrass, tumblegrass, silver bluestem, and buffalograss, and forbs such as broomweed, curlycup gumweed, western ragweed, queens delight, broom snakeweed, and prickly poppy become dominant and the woody plants begin to increase. Continued overgrazing and overuse of the rangeland results in complete takeover of the rangeland by woody species such as mesquite, yucca, sand sagebrush, juniper, salt cedar, and baccharis.

The mainstem of Red Deer Creek is formed by the junction of several large unnamed tributaries which originate on the High Plains about 4 miles west of Pampa and merge into one stream in the canyons several miles east of Pampa. The direction of flow is northeasterly across northern Gray County, southeastern Roberts County, and western Hemphill County. Red Deer Creek enters the Canadian River on the northern edge of the town of Canadian in the central part of Hemphill County. Bluff Creek, the largest tributary in the watershed, flows into the mainstem from the north in Roberts County. Washburn Draw, a moderately large tributary, flows into Red Deer Creek from the north in western Hemphill County. Numerous small tributaries enter the mainstem from both sides throughout the watershed.

There are about 290 miles of stream channels draining one square mile or more. Approximately 29 miles have intermittent flow, 9 miles have perennial flow from released sewage effluent, and the remaining 252 miles have ephemeral flow. Red Deer Creek has intermittent flow conditions throughout the central and lower reaches. Spring discharge in these reaches and in the lower reaches of several of the larger tributaries located downstream from Miami provides streamflow during the winter months when evapotranspiration rates

are low and during periods when precipitation is above normal. Sewage effluent from the Pampa treatment plant provides some permanent flow in a portion of the upper segment in Gray County. Most of the remaining streams have flow only after runoff producing rains occur.

All of the streams can be classified as natural except for about 8 miles of the mainstem lying between Miami and Pampa. Segments of the channel in this reach were modified for construction of the transcontinental Santa Fe Railroad and have been modified repeatedly since then in an attempt to reduce erosion and floodwater damages to the railroad. Severe streambank erosion is occurring in this reach and is also prevalent in streams lying in other portions of the steeply rolling canyon lands area. These stream channels are large, deep, and well defined. The channels in the lower reaches of the mainstem and some of the large tributaries are affected by aggradation with sand, resulting in formation of shallow and wide sand-bedded streams which meander across the flood plain in constantly changing patterns of flow.

The prevalent chemical type of dissolved solids in the runoff water in Red Deer Creek is the calcium and magnesium carbonate type. The total concentration of dissolved solids is unknown but is believed to be less than that of the ground water in the alluvium at Canadian, which contains about 400 p.p.m. solids.

Economic Data

The economy of the watershed depends upon agriculture and petroleum production. About 60 percent of the agricultural income is derived from the sale of livestock and their products and the balance from the sale of grain sorghum, wheat, hay, and cotton.

Land use and yields of the flood plain are: range, 1.5 animal unit months of grazing; improved pasture, 1 ton hay and 4 animal unit months of grazing; alfalfa, 6 tons; hay meadow, 1.5 tons; sorghum hay, 2.75 tons; and small grain, 15 bushels plus 3.33 animal unit months of grazing.

The fact that Texas now ranks first nationally in fed-cattle marketings is due primarily to the tremendous increase in large commercial feedlots in this section of the state. Ideal climatic conditions, readily available feeder cattle, and the production of grain sorghum, a mainstay of the feeding ration, are contributing factors to this increase. However, there are no feedlots which have any significant capacity located within the project area.

Hog production and feeding operations are also increasing in this area. Texas now produces less than 25 percent of the pork consumed

by its population so there appears to be a demand for this type of operation.

Feed, veterinary supply, meat processing, and associated industries all depend heavily on the livestock industry for their livelihood.

There are 177 operating units, averaging about 1,130 acres, located either wholly or partially in the watershed. Most of the land is owner operated. Market value of the land varies from about \$50 to \$300 per acre, depending on location and soil capability.

Eighty-eight operating units in the watershed are family-type operations employing less than 1-1/2 man-years of outside labor. About 26 of these units suffer damage from flooding. None of these are low income producing units; however, 9 or 10 of the operators have outside employment requiring from 25 to 50 percent of their time. This is done both to supplement their income and to occupy spare time. Some operators supplement their income by leasing hunting rights.

The "Work Force Estimates for Nonmetropolitan Counties in Texas for April 1972," the latest statistics which are available, shows a labor force of 14,405, or 46 percent of the total population of the three counties within which the watershed is located. Slightly over 2.7 percent, or 390 workers, are unemployed. This is below the state and national rate of unemployment. Approximately 1,325 workers, or 9 percent of the labor force, are employed in the agricultural sector. The nonagricultural sector employs about 12,690 workers, of which 2,390 are in the manufacturing sectors and 10,300 are in non-manufacturing sectors.

The city of Pampa is located in the upper portion of the watershed. It is a thriving city, having manufacturing and processing facilities for agricultural and petroleum products and providing good schools, churches, hospitals, goods, and services for residents of the watershed. The city of Canadian is located near the confluence of Red Deer Creek and the Canadian River. The city of Miami is located near Red Deer Creek about midway between the aforementioned cities. The latter two cities also provide facilities and services needed by the watershed populace. Good highways and a railroad link these cities with other population and marketing centers in all directions. Approximately 110 miles of paved roads and 118 miles of all-weather roads serve the watershed residents.

Fish and Wildlife Resources

The only fish habitat in the watershed occurs in the farm and ranch ponds constructed to provide livestock water.

Wildlife species which occur in the project area include white-tailed deer, antelope, quail (scaled and bobwhite), mourning dove, turkey, lesser prairie chicken, squirrel, ring-necked pheasant, coyote, jackrabbit, cottontail, bobcat, waterfowl, skunk, opossum, and other furbearers. Populations of most species of wildlife are low. Moderate numbers of waterfowl, including mallards, pintails, blue-winged teal, green-winged teal, snow geese, white-fronted geese, Canada geese, and others, visit the watershed area during wet years. Hunting of gamebirds and animals is mainly by landowners, their families and guests, and a limited number on a fee hunting basis. There is no hunting of squirrels or furbearers. Some hunting of coyotes, coons, and rabbits is done occasionally.

Several species of birds and mammals listed as threatened nationally by the U. S. Department of the Interior may possibly occur in the watershed and surrounding area. The lesser prairie chicken, which is on this list, occurs within the watershed. The watershed lies within the known range of the rare prairie falcon and also lies along the migration routes of the whooping crane and eskimo curlew, both of which are listed as threatened species. The endangered black-footed ferret which occurs in habitat similar to that in the watershed is extremely rare and not thought to exist in Texas. Other threatened species which may be rare visitors to the High Plains and possibly the watershed area include the southern bald eagle and the American peregrine falcon.

Recreational Resources

Opportunities for most forms of outdoor and water-based recreation are limited for residents of the watershed. Most forms of water-based recreation are available to residents at distances of about 50 miles at Lake Meredith on the Canadian River and Greenbelt Lake on the Salt Fork of the Red River. Hunting is available to the landowners, their families and friends, and to a limited extent to others, on a fee basis. Picnicking facilities are available at city-owned parks.

Archeological and Historical Values and Unique Scenic Areas

There are no historic sites listed in the National Register of Historic Places in the watershed. The Texas State Historical Commission (the responsible state agency) indicated that the general area is rich in prehistoric remains and includes large village areas. Their records show that there are three important paleontological sites; a mineralogical site; an historic lime firing site; the ghost town of Mendota; the junction of the Rath and Jones-Plummer Trails; and several important archeological localities within the area, one of which has been recommended for inclusion in the National Register of Historic Places.

Under contract with the National Park Service, U. S. Department of the Interior, a detailed archeological study of the watershed is being made by the Archeological Research Laboratory, Killgore Research Center, West Texas State University at Canyon, under the direction of Dr. Jack T. Hughes as principal investigator. A preliminary report has been prepared for the portions of the watershed that may be affected by the proposed project measures. The following is quoted from the preliminary report: 1/

Prior to the present survey, the P-PHM [Plains-Panhandle Historical Museum] and WTSU [West Texas State University] had recorded only 14 sites in the watershed: 10 archeological sites (A217-A222, A322, A323, A424, and A873); one historic site (H20); and three paleontological sites (P39, P134, and P135). Of these, only one paleontological site (P134) is located in a reservoir area.

During the present survey, with fieldwork nearly finished, 67 additional sites have been recorded to date: 62 archeological sites (A1227-A1288); one historic site (H29); and four paleontological sites (P246-P249). Of these only 30 archeological sites (see below) are located in or near a reservoir area.

No sites have yet been recorded in or near five of the reservoirs, numbered 11, 13, 14, 17, and 19. Fifteen of the reservoirs (see below) have sites that may be affected by reservoir construction.

All of the archeological sites in or near the reservoirs are occupational areas, ranging from very small temporary campsites evidenced by as little as a single rock hearth, through larger and less transitory campsites evidenced by a scattering of rock hearths and flint flakes, to large permanent village sites evidenced by an abundance and variety of lithic, ceramic, faunal, and other remains. Most of the sites are surficial, but a few are deeply buried. Exposure varies from limited to extensive. Further work will be required at most of the sites to determine their ages, but several can be dated with present evidence as Archaic or Neo-Indian.

1/ Hughes, Jack T., Harlen C. Hood, and Billy Pat Newman, Preliminary Report on an Archeological Survey of the Red Deer Creek Watershed, Archeological Research Laboratory, Killgore Research Center, West Texas State University, Canyon, Texas, July 25, 1974. This report is available for review by qualified persons at the State Office, Soil Conservation Service, First National Bank Building, Temple, Texas 76501.

Reservoir No. 1 has four archeological sites: Al228, Al229, Al230, and Al232. Al228 is on the east side of the valley between the dam and the spillway. It is a small sparse campsite of uncertain age. Al229 is on the west side of the valley in a possible borrow area about 100 yards southwest of the west end of the dam. It is a large sparse campsite of Archaic age. Al230 is on the east side of the valley in a possible borrow area about 350 yards below the dam. It is a moderately large and productive campsite of Archaic age. Al232 is on the east side of the valley in the pool about 100 yards above the dam. Only one rock hearth was observed.

No. 2 has one archeological site, Al233, which is on the north side of the valley in the middle part of the pool. It is a very small sparse campsite of uncertain age.

No. 3 has five archeological sites: Al239, Al240, Al241, Al242, and Al243. Al239 is on the south side of the valley in the upper end of the pool. It is a small sparse campsite of uncertain age. Al240 is on the south side of the valley in the pool about 100 yards above the dam. It resembles Al239. Al241 is in the pool about 200 feet northeast of Al240. It resembles Al239. Al242 is on the south side of the valley in the spillway. Only one rock hearth was observed. Al243 is in the spillway about 100 yards east of Al242. It resembles Al239.

No. 4 has one archeological site, Al245, which is on the west side of the valley in a possible borrow area about 350 yards below the dam. It is a small sparse campsite of uncertain age.

No. 5 has one archeological site, Al252, which is on the west side of the valley in the pool about 150 yards above the dam. It is a small sparse campsite of uncertain age.

No. 6 has one archeological site, Al249, which is on the west side of the valley in a possible borrow area about 200 yards northwest of the west end of the dam. It is a moderately large but sparse campsite of uncertain age.

No. 7 has one archeological site (Al254) and one paleontological site (P134). Al254 is on the east side of the valley in the spillway. It is a small sparse campsite of uncertain age. P134 is on the east side of the valley just above the dam. It is a small excavation in Ogallala sands that revealed a few scraps of fossil bone, including pieces of turtle shell.

No. 8 has one archeological site, A1266, which is on the north side of the valley in the pool about 150 yards above the dam. It is a small sparse campsite of uncertain age.

No. 9 has four archeological sites: A1260, A1261, A1263, and A1264. A1260 is on the east side of the valley in the spillway. It is a small sparse campsite of uncertain age. A1261 is on the west side of the valley in a possible borrow area about 100 yards northwest of the west end of the dam. It is a moderately large and productive campsite of uncertain age. A1263 is on the west side of the valley in a possible borrow area about 150 yards southwest of the west end of the dam. Only one rock hearth was observed. A1264 is on the west side of the valley in a possible borrow area about 200 yards south of the west end of the dam. It is a small sparse campsite of Archaic age.

No. 10 has one archeological site, A1267, which is on the north side of the valley in a possible borrow area about 100 yards southeast of the north end of the dam. It is a small sparse campsite of uncertain age.

No. 12 has two archeological sites: A1268 and A1269. A1268 is on the south side of the valley in the middle part of the pool. It is a very small and sparse but deeply buried campsite, probably of Archaic age. A1269 is on the north side of the valley near the upper end of the pool. It is a moderately large, productive, and deeply buried campsite of Neo-Indian age.

No. 15 has four archeological sites: A1274, A1275, A1276, and A1278. A1274 is on the south side of the valley in a possible borrow area about 350 yards northwest of the south end of the dam. Only one rock hearth was observed. A1275 is on the south side of the valley under the south end of the dam. It is a large productive village site of Neo-Indian age. A1276 is on the south side of the valley in a possible borrow area about 300 yards west of the south end of the dam. It is a small sparse campsite of uncertain age. A1278 is on the north side of the valley in a possible borrow area about 200 yards east of the north end of the dam. It is a large productive village site of Neo-Indian age, with considerable depth.

No. 16 has one archeological site, A1271, which is on the south side of the valley in a possible borrow area about 350 yards south of the south end of the dam. It is a small sparse campsite of uncertain age.

No. 18 has two archeological sites: A1280 and A1281. A1280 is on the south side of the valley in the pool about 250 yards above the dam. It is a moderately large but sparse campsite of Neo-Indian age. A1281 is on the north side of the valley in the spillway. It is a small sparse campsite of uncertain age.

No. 20 has one archeological site, A1283, on the west side of the valley in a possible borrow area about 200 yards west of the west end of the dam. It is a small sparse campsite of uncertain age.

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At this point in our research, it appears that most of the best archeological sites in the Red Deer Creek watershed happily are located along the main valley rather than in the tributary valleys where all but one of the reservoirs are planned.

Soil, Water, and Plant Management Status

The watershed and surrounding area was first settled and divided into several large ranches by cattlemen in the 1870's and 1880's. In the early 1900's, the large units on the High Plains were divided into smaller units and the native grassland plowed up for dryland crop production. Irrigation development and expansion followed during the 1930's and 1940's with water obtained from wells drilled into the underlying Ogallala Formation aquifer. About 7,630 acres, or 17 percent, of the cropland is presently being irrigated. The steeply rolling canyon lands of the Rolling Red Plains area are unsuited for crop production and have remained in native grassland. Subirrigated flood plain lands in the Red Deer Creek valley have also remained in native grassland and have been used mainly as meadows for the production of hay.

The Gray County, the Roberts, and the Hemphill County Soil and Water Conservation Districts, with technical assistance from Soil Conservation Service personnel headquartered at Pampa, Miami, and Canadian, have aided owners and operators of watershed lands in the development of soil and water conservation plans and the application of needed land treatment measures. All of these districts have been in operation for 20 years or longer, with the oldest district, Hemphill County Soil and Water Conservation District, having been organized in 1942.

Soil and water conservation plans have been developed on 146 of the 177 operating units located wholly or partially within the watershed. This represents 88 percent of the agricultural land in the watershed.

It is estimated that 60 percent of the needed land treatment has been applied. The total cost of this application is estimated at \$1,303,150.

The Rural Environmental Conservation Program, administered by the Agricultural Stabilization and Conservation Service, and the Great Plains Conservation Program, administered by the Soil Conservation Service, are encouraging the application of needed land treatment measures by providing financial assistance.

The Texas Forest Service, cooperating with the U. S. Forest Service as part of the existing Title IV program, is available to provide technical assistance to landowners in planning forestry measures such as tree plantings for recreation and aesthetic purposes, and for wood products.

Projects of Other Agencies

There are no existing or soon to be constructed water resource development projects within the watershed which have a direct relationship to the works of improvement included in the plan.

The nearest existing reservoir downstream from Red Deer Creek is the Eufaula Reservoir, which is located about 400 miles downstream on the Canadian River. It has a total drainage area of 47,500 square miles. This watershed project should have no measurable effect on this reservoir.

The States of New Mexico, Texas, and Oklahoma have entered into a compact to allocate water originating in the drainage basin of the Canadian River among the states. This compact regulates conservation storage but excludes any portion of the capacity of the reservoirs solely for flood control, power production, and sediment control. The capacity of the floodwater retarding structures in this watershed plan are for flood control and sediment control only.

WATER AND RELATED LAND RESOURCE PROBLEMS

Land and Water Management

Application of needed conservation land treatment measures is being achieved at a satisfactory rate in all areas of the watershed except on the badly eroding canyon lands of the Central Rolling Red Plains Land Resource Area. The soils of this area produce excellent quality forage and are used exclusively for rangeland. Deeply incised and actively eroding gully and channel systems with steep gradients are common throughout this geologically unstable area. Large drainage areas and steep gradients combined with relatively low economic returns

per acre discourage landowners from applying any great number of grade stabilization structures, debris basins, or other mechanical treatment measures. Ranchers, however, have been installing the measures on some of the suitable smaller drainage areas, often in conjunction with storage needed for livestock water supply.

These measures are very effective in stabilizing erosion under average rainfall conditions. However, large storms producing excess runoff in the steep drainage areas often overtop and destroy these structures, creating new erosion damages that are as severe as those existing before treatment.

Past overgrazing and poor management practices have caused an imbalance in the composition of the native plants on large areas of rangeland. Woody plants, which use a tremendous amount of water per pound of dry matter produced, have crowded out the grasses and forbs, which provide better soil protection and forage for livestock as well as food for some species of wildlife. Control of these plants is needed to restore a well balanced plant community which will protect the soil and provide forage and food sources for livestock and wildlife.

It is estimated that 12,000 acres have become infested with mesquite, 15,000 acres have become infested with sand sagebrush and/or yucca, and 1,200 acres have become infested with willow, saltcedar, and baccharis.

Floodwater and Sediment Damages

There are about 8,090 acres of valuable flood plain land in the watershed, excluding stream channels, that are subject to severe floodwater and sediment damages. This is the area that would be inundated from a 100-year frequency flood event. At the present time, land use of the flood plain is about 12 percent hay meadow; 3 percent sorghum for hay and grazing; 2 percent alfalfa; 2 percent small grain; 2 percent improved pasture; 77 percent native range; and 2 percent miscellaneous. The flood plain land, much of which is subirrigated, has been used extensively for hay meadows in past years, but damages from floodwater and sediment deposition have caused much of this land to deteriorate to low production range.

Large floods that cause severe floodwater and sediment damages occur on an average of one every four to five years. The most recent flood occurred in November 1971; other severe floods occurred in 1970, 1969, 1968, 1960, 1957, 1955, 1951, 1941, and 1937. Most of the larger floods occur in the spring and fall months, although flooding can occur at any time of the year.

Damages from floodwater and sediment that result from the larger floods are interrelated to such an extent that they are difficult

to separate. The damaging sediment, consisting of fine-grained, relatively infertile sand, is derived from the highly erosive canyon-incised uplands. Large floods sweep down the Red Deer Creek canyon, leaving a wide strip of clean, practically bare sand. A blanket of sand covers most of the native grass meadow and other vegetation. The vegetation not buried by sand is usually uprooted by erosive forces associated with the high velocity of the floodwater. Re-establishment and recovery of the native grasses usually require several years following the flood event, and before recovery is complete, another flood occurs. Gusty winds drift the barren sand deposition and create dunes and bars. These serve as barriers and cause even small flood flows to move back and forth over a broad expanse of flood plain.

Small floods occur at some locations on the average of at least once per year. These floods do much the same type of damage as large floods but cover less area, deposit less sediment, and generate less destructive velocities.

An estimated 6,720 acres, or over 80 percent, of the fertile flood plain lands are being damaged by sediment deposition. This damage ranges from 15 to 90 percent in terms of reduced productivity. Some of this damage will require as much as 15 years to recover. Damage is most severe and is felt most acutely by flood plain operators between Miami and Canadian. Soils in this flood plain reach are sub-irrigated, and in an undamaged condition, produce two or more tons of high quality native grass hay per acre.

The average annual damage in net lost production because of sediment deposition is estimated to be \$112,200. Not all of this damage is considered fully recoverable. The recoverable portion is estimated to be \$74,010 annually and is hereinafter referred to as the without project damage in both the narrative and tables of this work plan. The average annual volume of sediment delivered out of the watershed into the Canadian River is 148,000 tons.

The portion of the average annual sediment load carried as suspended sediment is 138,000 tons, which is the equivalent of 11,400 p.p.m. in the 8,960 acre-feet of average annual volume of runoff from the watershed. This sediment concentration is many times greater than the dissolved solids concentration of the runoff, which averages less than 400 p.p.m.

Flooding and the resultant floodwater damages are increasing in severity as a result of loss in channel capacities due to continued sediment deposition. When recurrent flooding is considered, the cumulative area flooded during the evaluation period averaged 5,047 acres annually.

Floodwater damages occur to crops and pastures, other agricultural properties, public roads and bridges, railroads, and urban areas in Miami (Appendix D) and Canadian (Appendix E). The flood of September 1970 covered a small areal extent but flooded several businesses and residences along Bluff Creek in Miami, and Farm-to-Market Road 282 was overtopped. The flood of November 1971 damaged portions of the levee protecting the urban area of Canadian subject to flooding.

Floodwater damages to crops and pastures, although not as severe or spectacular as those resulting from sediment, average \$24,710 annually. Losses to other agricultural properties such as fences, corrals, windmills, and ranch roads average \$31,730 annually.

Miami has urban property which suffers floodwater damage. The Roberts County Park located in Miami, several residences and business establishments, water lines, natural gas lines, and the city's sewerage plant have suffered considerable damage in the past. U. S. Highway 60, an important highway for east-west travel, has been blocked numerous times during past years at a tributary located in the east part of town. It is estimated that average annual damages for the urban area of Miami amount to \$1,350.

Canadian has urban property, primarily residential, located in a low-lying area subject to flooding. One manufacturing plant producing drillers mud for the oil industry has a large investment in its property in this low-lying area. During the early 1920's the railroad began the installation of measures to protect maintenance facilities at Canadian. These measures consisted of earth dikes, pile jetties, Rehfield jetties, Kellner jetties, rock cribs, etc., and were for the purpose of preventing further encroachment of Red Deer Creek upon these facilities. Sandy sediment, both water and windborne, accumulated in dune-like fashion along the line of protective measures. Natural vegetation became established and a levee-like effect resulted. This provides protection to the city of Canadian from flooding up to and including the 10-year event. Average annual damages to the urban area of Canadian are estimated at \$4,070.

The increased channel elevation, in combination with sand bars and other barriers created by the wind, has caused floodwaters to encroach upon and severely damage tracks, culverts, and bridges of the Atchison, Topeka, and Santa Fe Railway, which traverses the entire length of the mainstem flood plain. This railroad is one of the main links for east-west traffic of freight. The rails hum almost continuously, both day and night, as thousands of cars go through the watershed daily. The railroad has had an incessant struggle to operate and maintain the track. The myriad protective measures installed to hold Red Deer Creek at bay include steel

jetties, riprap, concrete blankets, car bodies, and retaining walls. Transcontinental traffic has been interrupted many times for periods of a few hours to several days as the result of track and bridge washouts. These delays and losses cost our nation dearly.

Direct damages, and interruption of traffic and attendant loss of revenue, have been so severe during the past years that the company proposes moving 6.86 miles of track in the vicinity of Mendota in order to reduce the most severe damage and interruption. The capital cost of the modification is estimated to be \$3,240,200 at current (1974) prices. The annual equivalent value, amortized for 100 years, is \$191,010. Average annual direct floodwater damages to railroad properties not proposed for relocation are estimated to average \$64,390 annually. Average annual total damage is estimated to be \$255,400.

Increased flooding as the result of sediment deposition has made it nearly impossible to maintain the bridge on the county road crossing Red Deer Creek at Mendota. This bridge either washes out or has its approaches washed out nearly every year. One resident commented that he remembered one particularly wet year in which the bridge was made impassable 10 times. The removal of sediment deposited at bridge openings has increased maintenance costs at all bridges throughout the watershed. The bridge crossing Red Deer Creek at Canadian was destroyed in 1941, as was the bridge at Miami in 1951. One life was lost when the Miami bridge collapsed. Average annual damages to roads and bridges (highway) are estimated at \$11,790.

Erosion Damage

Gross erosion in the watershed, which averages about 6.5 tons per acre annually, ranges from slightly over one ton per acre annually in the extensively cultivated High Plains to more than 130 tons per acre annually in parts of the canyon-incised Rolling Red Plains. The highly erodible Rolling Red Plains area is deeply dissected by degrading stream channels and gullied lands. Active overfalls in the stream channels add to the volume of soil movement and create new unstable areas. These erosive processes, while severe throughout the Rolling Red Plains area of the watershed, are most severe on the south side of Red Deer Creek in the Hoover to Miami area. Vegetative cover on stable lands lying between the channels and gullies is generally in fair to good condition. Present grazing management allows for maintenance of protective cover on these lands.

Of the total gross erosion now occurring in the watershed, 6 percent is sheet erosion in the extensively cultivated soils of the High Plains area; 66 percent is sheet and gully erosion in the canyon-incised Rolling Red Plains area; 21 percent is from streambank

erosion in the uplands; and 7 percent is from streambank erosion in the flood plain.

Streambank erosion is destroying an average of 11.6 acres of productive land within the watershed each year. Of this, 9.7 acres are being destroyed in the unstable areas of the uplands and the remaining 1.9 acres are in the flood plain. Eroding streambanks of up to 50 feet in height are common on some of the larger tributaries. Most of the flood plain streambank erosion is occurring in the Hoover to Miami reach. The most severely eroding segment occurs immediately downstream from Hoover. Vegetation supported by sewage effluent from the Pampa treatment plant has generally stabilized the channel upstream from Hoover. Average annual damage by streambank erosion is \$2,510, of which \$770 is flood plain damage and \$1,740 is upland damage.

Railroad roadbed erosion associated with streambank erosion is a serious problem in the flood plain from Hoover to Canadian. Miles of riprap, jetties, piling, and steel tetrahedrons have been installed to minimize this damage. Additional treatment is required as streambank erosion encroaches on new areas of track in the Hoover to Miami reach and as changing stream channel alignment causes erosion problems in other areas. Costs of installing additional new measures and maintaining existing measures for roadbed protection are included in the floodwater damages to the railroad.

Indirect Damage

In addition to the above direct damages, it is estimated that indirect damages resulting from interruption of travel, mail service and freight deliveries, as well as disruption of livestock feeding and management regimen and other losses, amount to an average of \$66,100 annually.

Irrigation

About 7,630 acres of cultivated land are currently being irrigated within the watershed and a considerably larger area is being irrigated on the High Plains area adjoining the watershed. All of the irrigated land in the High Plains, both within and adjacent to the watershed, is being irrigated with water obtained from wells in the Ogallala Formation. A small area of alfalfa and hayland is being irrigated with ground water obtained from the alluvium in the Red Deer Creek valley.

Water from the Ogallala Formation and the alluvium in Red Deer Creek valley is of good quality for irrigation of crops. The supply of ground water in the alluvium is adequate for present and future use. However, water usage from the Ogallala Formation presently exceeds natural recharge and is causing a serious decline of the water table.

The rate of decline, though not as rapid as in some other parts of the High Plains of Texas, will result in increased cost of pumping irrigation water.

The nearly flat, deep, highly productive clayey soils of the High Plains are highly suitable for surface irrigation. The irrigated crops, listed in order of predominance, are grain sorghum, hay, wheat, and grazing crops. More than 80 percent of the needed water-conserving irrigation pipelines have been installed to replace water-wasting open ditches for conveyance of water from wells to the field. Other irrigation practices for proper utilization and conservation of irrigation water have been installed on more than 50 percent of the irrigated land.

Natural recharge of the Ogallala aquifer is poor on the surface of the High Plains because of slowly permeable clayey soils. The optimum area of natural recharge is on the sand and gravel beds which are exposed in the rough broken lands and canyons below the High Plains surface in favorable locations such as the Red Deer Creek valley upstream from Miami.

Municipal and Industrial Water

The cities of Miami and Canadian rely on shallow wells for municipal water supply. The Miami wells are in the Ogallala Formation and the Canadian wells are in the alluvium. Pampa formerly obtained its water from wells in the Ogallala Formation but now uses surface water obtained from Lake Meredith on the Canadian River. The quality and sources of water are adequate to supply the future needs of these municipalities. Canadian may have to install additional wells to supply expected future needs.

Recreation

There is a need for more outdoor recreational facilities, especially opportunities for water-based recreation, in and near the watershed. The nearest available opportunity for water-based recreation by residents is about 50 miles away at Lake Meredith and at Greenbelt Lake. Low volume of runoff and high losses due to evaporation and seepage are the major factors which discourage development of water-based recreational facilities within the watershed.

Fish and Wildlife

The populations of most species of wildlife are generally low because of lack of permanent water sources and year-round food supplies, and not enough cover. Flooding is very detrimental to quail, dove, pheasant, turkey, ground-nesting birds and burrowing animals. Stream-bank erosion and overbank deposition of sediment are damaging the

habitat for quail, turkey, and deer. One of the most important factors is lack of proper management for wildlife. Landowners have not managed their lands for this resource because in the past it produced little economic returns. This trend is changing as the demand for places to hunt increases and the landowner begins to realize a reasonable income from managing for wildlife as well as cattle.

The only fishery habitat in the watershed is ponds constructed by landowners for livestock water. There is a need for additional habitat in order to meet the demands for sport fishing in the area.

Economic and Social

Large operating units and oil production help stabilize the agricultural economy. Future economic development will be more dependent on agricultural production as oil production decreases. None of the family farms in the problem area are low income producing units; however, about 10 of the operators have outside employment to augment their income. Additional employment opportunities are needed for the 390 unemployed workers in the watershed area. The population of Pampa, Miami, and Canadian decreased by 10.6 percent between 1960 and 1970. Further decreases in population could be stopped with a concentrated effort in community development and additional employment opportunities.

Other

Water for rural domestic and livestock use is obtained from the same ground water sources as the irrigation water. These sources are adequate and the quality of water is satisfactory for this use.

No serious problem of stream pollution from the oilfields was observed in the watershed. Sewage treatment facilities of the municipalities are adequate or are in the process of being made adequate to properly treat all sewage. There are no feedlots which have any significant capacity located within the project area. There are a few small feedlots or warmup pens within the project boundaries, but they do not appear to be causing any stream pollution problems.

RELATIONSHIP TO LAND USE PLANS, POLICIES, AND CONTROLS

The watershed project, as formulated, does not conflict with the objectives and specific terms of approved or proposed federal, state, or local use plans, policies, and controls. The Board of Directors of the Panhandle Regional Planning Commission considered and unanimously endorsed the project and the draft environmental impact statement.

ENVIRONMENTAL IMPACT

Flood Prevention, Erosion, and Sediment

The installation of conservation land treatment measures on 39,010 acres of land in addition to effectively maintaining those already applied will protect soil, water, and related resources by reducing soil erosion, reducing water pollution by sediment, conserving irrigation water, reducing runoff, and reducing air pollution by blowing dust.

The application of cropland treatment measures such as contour farming, terraces, grassed waterways, and diversions on an additional 11,480 acres of cropland will slow the rate of runoff and reduce the rate of erosion on sloping untreated fields from present rates of over 8 tons per acre annually to less than 4 tons per acre. Conservation cropping systems and crop residue management will provide soil protecting cover to reduce erosion caused by the falling raindrop and help maintain soil productivity for a sustained agriculture. Irrigation water management and associated irrigated land treatment measures, including irrigation land leveling, irrigation pipelines, and irrigation systems, provide for more efficient use of irrigation water and reduce erosion of the soil through the application of the water.

The application of pastureland treatment measures, including pasture and hayland planting and proper management on 680 acres, will protect the soil from erosion and slow down the rate of runoff by providing a good ground cover on this intensively used land.

The application of rangeland treatment measures, including grazing management, range seeding, proper grazing use, deferred grazing, brush management, and ponds on 26,850 acres of rangeland, will increase the productivity and the density of desirable grasses and forbs normally found in the natural plant community. Increasing the density of grasses and forbs will improve effective soil-protecting cover from poor and fair condition to fair and good condition, and reduce erosion rates in the erosive steeply rolling areas to be treated from an average soil loss rate of more than 10 tons per acre annually to less than 3 tons per acre annually. The ponds installed for watering livestock will reduce livestock travel and distribute grazing to prevent overuse of vegetation near watering spots while under-utilizing the vegetation at greater distances from water.

The installation of all project measures, conservation land treatment and floodwater retarding structures, will provide flood protection to 7,960 acres of flood plain land. About 130 acres of flood plain

subject to damage under without project conditions is located within the pool areas of floodwater retarding structure No. 2.

Average annual flooding within the benefited area will be reduced from 5,037 acres to 2,155 acres, a reduction of 57 percent. Reduction in area inundated varies with respect to location within the watershed. The proposed project will provide protection from the 100-year event to all existing urban properties in Miami. Remaining out-of-bank flooding from a 100-year event will be limited to miscellaneous lands along the stream channel below floodwater retarding structure No. 13 and along an unnamed tributary at the west side of town for which no structural control is needed or planned.

The proposed project, in conjunction with the existing levee, will protect the urban area of Canadian along Red Deer Creek from all flood events up to and including the 100-year frequency event. The levee was considered in place when determining the effects the project would have on flooding in the urban area.

Project installation is expected to eliminate the need for the proposed relocation of 6.86 miles of track belonging to the Atchison, Topeka, and Santa Fe Railway Co.

The flood plain will continue to be used primarily for grazing and hay production. The reduction in floodwater and sediment damages will enable farm and ranch operators to manage over 4,000 acres of fertile flood plain for native hay meadow. This land has a potential of over two tons of hay per acre when managed properly. Native grass hay is eagerly sought by horse owners and trainers and is also excellent feed for cattle during the winter and early spring months when supplemental feed is required.

Sheet erosion on cropland and rangeland will be reduced by slightly over 10 percent after the installation of the additional land treatment measures included in the project. These measures will have only minor effects on gully and streambank erosion in the geologically unstable steep canyon lands. Installation of the floodwater retarding structures will provide stabilizing effects for reducing streambank erosion upstream as sediment accumulates in the pool areas and will reduce the erosional energy of the flood flows in the downstream channels. Average annual land voiding from streambank erosion on the flood plain will be reduced from 1.9 acres to 0.5 acre, or 74 percent, and from 9.7 acres to 6.9 acres, or 29 percent, in the upland.

Average annual sediment deposition on the flood plain will be reduced from 450,000 tons to 160,000 tons, or 64 percent. The majority of the sediment which will be deposited on the flood plain following project

installation will be fine-textured material far less damaging than the material being deposited under without project conditions. The average annual volume of sediment, both suspended load and sand bed-load, carried out of the watershed into the Canadian River will be reduced from 148,000 tons to 74,000 tons, a reduction of 50 percent. The suspended portion of the annual sediment load is 138,000 tons under without project conditions and 70,000 tons after installation of the project. This represents a suspended sediment concentration of 11,400 p.p.m. in the annual runoff of 8,960 acre-feet under without project conditions and 6,700 p.p.m. in the annual runoff of 7,816 acre-feet initially after installation of the project.

The reduction in flooding and floodwater velocities, sediment deposition, and erosion will reduce crop and pasture damages by 63 percent; other agricultural damages, 62 percent; railroad damages, 95 percent; road and bridge (highway) damages, 77 percent; overbank deposition damages, 74 percent; and streambank erosion damages, 43 percent; and will eliminate urban damages from all flooding up to and including the 100-year event. Highway 60, frequently flooded under without project conditions, should never again be closed by high water from a flood of less than 100-year frequency. The installation of structural measures will enable Hemphill County to install a permanent bridge at Mendota Crossing. Sediment damages at all bridge openings will be reduced. The railroad can be operated and maintained within tolerable levels of interruption and can provide more efficient service to satisfy transcontinental demands.

The installation of all measures, both land treatment and structural, will provide flood protection to about 26 farm or ranch units, of which 13 are family-type operations. As the result of installation of structural measures about 15 residences, mobile homes, businesses, and public facilities of the city of Miami will be protected from flooding. The entire population of Miami will receive flood protection through the alleviation of damages to the city's sewerage system and utility lines supplying water and natural gas to residences and commercial establishments. Twenty-four residences and one large commercial enterprise will be protected from flooding in the city of Canadian.

Runoff detained by floodwater retarding structures will seep into and recharge the Ogallala Formation, the primary source of irrigation water used in the immediate area. About 30 irrigation farms are expected to benefit from this recharge. The average annual recoverable volume of this recharge is estimated to be 1,330 acre-feet immediately following the installation of the structural measures. The recharge is expected to diminish gradually until its recovery has little significance by the 100th year following project installation.

Immediately after their completion, evaporation and seepage losses in the sediment pools of the floodwater retarding structures will cause a minor reduction in the average annual volume of streamflow in Red Deer Creek and the Canadian River. It is estimated that intially streamflow at the U. S. Geological Survey gage on the Canadian River near Canadian, Texas, will be reduced by about three-tenths of 1 percent, based on an analysis of the gaged records for the period 1939 through 1969. As sediment accumulates in the sediment pools, the streamflow will again approach pre-Public Law 566 project conditions. The project will have no known impacts on downstream water rights.

Fish and Wildlife and Recreation

The fish and wildlife resources and recreational opportunities in the watershed are expected to be improved with the installation of the land treatment measures and the floodwater retarding structures included in the project. The use of 337 acres of rangeland and 15 miles (129 acres) of dry stream channels to impound water in the sediment pools will reduce the amount of habitat for wildlife but will enhance the remainder by providing a more dependable water supply. The 466 acres of surface water in the sediment pools will also provide opportunities for development of fisheries and water-based recreation. These pools will provide resting areas for waterfowl and aquatic habitat for some fur animals. Habitat conditions for ground-nesting birds and burrowing animals on the flood plain will be improved through reduced flooding, streambank erosion, and overbank deposition. The reduction in sediment load contributed to the Canadian River from Red Deer Creek will improve the fish habitat in the Canadian River. Removal of the existing vegetation from 230 acres of rangeland needed for construction of dams and emergency spillways will temporarily affect wildlife habitat on this land. Revegetation of the dams and bare areas with multi-use plants will result in replacement of the present habitat with a higher quality habitat.

The floodwater retarding structures will not detract from the natural scenic beauty of the watershed. The vegetated embankments of the structures will blend in with the grass-vegetated, rough, deeply incised canyon country topography in which they are located. Permanent water stored in some of the sediment pools will form attractive bodies of water in this water deficient area.

The proper installation of the cropland treatment practice of crop residue management will improve wildlife habitat by leaving waste grain along with the crop residues on the surface of the soil for use by wildlife. The installation of farm and ranch ponds for livestock water in the uplands will also provide needed watering spots for wildlife. The application of fishpond management practices on 90 ponds will improve the fish habitat in these waters.

The application of wildlife upland habitat management as a secondary land treatment measure on 84,000 acres of agricultural land will help farmers and ranchers develop a greater awareness of the needs of wildlife for improved habitat and for increased populations. The application of brush management on rangeland by leaving strips and mottes of brush of good habitat value in favorable locations for use as browse and cover by wildlife will maintain needed habitat on rangeland being restored to its natural grassland vegetation. Increase in density of grasses and forbs on the treated rangelands will improve the quality of habitat for the lesser prairie chicken. Should the forb growth on the treated rangelands prove to be inadequate for the needs of doves and quail, soil disturbance by disking and chiseling would be encouraged. Two or three such disturbed areas of 5-acre plots per 640 acres of rangeland would be adequate to provide the forbs for doves and quail. Establishment of forest management on the gullied lands for erosion control will also provide valuable habitat for wildlife.

Installation of the project will generally have little or no effect on endangered species other than the lesser prairie chicken. As has been mentioned previously, the installation of rangeland conservation treatment measures will improve the grassland habitat required by the lesser prairie chicken. Permanent water impoundments in the sediment pools of the structures which are expected to hold water could provide possible resting sites for migrating whooping cranes.

Archeological, Historic, and Scientific

Installation of the proposed structural measures will not affect any known historic sites.

One paleontological site (P134) occurs near the area to be affected by installation of floodwater retarding structure No. 7 and could be disturbed if care is not taken during construction to preserve this site.

Of the 30 archeological sites described as occurring in or near the areas to be affected by installation of floodwater retarding structures, 17 are located in the pool areas or the dams and emergency spillway areas, another 8 sites are located 100 to 300 yards away from these areas, and the remaining 5 sites lie more than 300 yards away. 1/

1/ Hughes, Jack T., Harlen C. Hood, and Billy Pat Newman, Preliminary Report on an Archeological Survey of the Red Deer Creek Watershed, Archeological Research Laboratory, Killgore Research Center, West Texas State University, Canyon, Texas, July 25, 1974. This report is available for review by qualified persons at the State Office, Soil Conservation Service, First National Bank Building, Temple, Texas 76501.

Preliminary investigations indicate that soil materials for construction of the dams for the floodwater retarding structures will be obtained from borrow areas located in the pool areas and from excavation of the emergency spillways. It is not anticipated that any material will be needed or be obtained from outside of these areas.

The 17 archeological sites which will be disturbed and/or destroyed in the areas to be affected by the pools, borrow areas, dams, and emergency spillways are as follows (a description of these sites occurs in the section "Environmental Setting"):

<u>Floodwater Retarding Structure Number</u>	<u>Archeological Site Identification Number(s)</u>
1	A1228, A1232
2	A1233
3	A1239, A1240, A1241, A1242, A1243
5	A1252
7	A1254
8	A1266
9	A1260
12	A1268
15	A1275
18	A1280, A1281

The eight known archeological sites which will not be directly affected by the pool areas or the construction areas but lie within less than 300 yards of these areas and could be disturbed by parking of equipment, travel, roads, etc., if special precautions are not taken, include the following:

<u>Floodwater Retarding Structure Number</u>	<u>Archeological Site Identification Number(s)</u>
1	A1229
6	A1249
9	A1261, A1263, A1264
10	A1267
15	A1278
20	A1283

The five known archeological sites which lie 300 yards, or more, away from the construction and pool areas and can be avoided by the activities connected with construction of the structural measures include the following:

Floodwater Retarding
Structure Number

Archeological Site
Identification Number(s)

1	A1230
4	A1245
15	A1274, A1276
16	A1271

Installation of the project will provide protection to the numerous archeological sites which occur downstream from the structural measures in the main Red Deer Creek valley. The sites which occur in the main valley are described as the best sites in the watershed by the research archeologists.

Economic and Social

Economic impacts on the local area resulting from the project will include the additional requirements for fertilizer, as well as additional seed, petroleum products, repair services, and some new haying equipment. Increased efficiency of management on about 4,000 acres of flood plain meadow will require the use of an additional 100 tons of fertilizer annually. This rate of application of fertilizer on subirrigated dryland meadow is not expected to have any detrimental effects on water quality. New fencing will be required for proper management of hay meadows.

Increased agricultural efficiency will be realized by the operators of land that will become productive after damaging flooding and sediment deposition have been alleviated. The reduction of damages by structural means will provide an impetus for a higher quality of living and social upgrading by watershed residents.

It is expected that approximately \$86,240 in the form of increased income to households will be realized by the local economy annually. The increased needs of the entire economy will create the equivalent of 13 permanent jobs for local residents. 2/

During the construction stage of the proposed project, additional requirements for building materials, petroleum products, and other necessities will stimulate the economy. This construction will create approximately 99 man-years of employment, which will further strengthen the economy during the construction phase.

Other

The use of the 2,775 acres of land for installation of the project will impose certain restraints upon its future use. Utilization of

2/ By adaptation of "Texas Interindustry Analysis - Part I"

the lands will be restricted to a use which will not interfere with the operation and maintenance of the structures or cause loss of life or significant property damage. The destruction of vegetation on 230 acres of rangeland needed for the dams and emergency spillways will prevent this land from being used by livestock and wildlife during the installation period; however, this loss will be temporary until the area is revegetated. The use of 337 acres of rangeland and 129 acres (15 miles) of dry streambed to initially store water until displaced by sediment will cause a change in land use. The use of 1,900 acres of rangeland and 179 acres (23 miles) of dry streambed to temporarily store floodwater will occasionally interrupt the use, but will not result in any changed land use.

The structural measures will not adversely affect petroleum or other mineral production in the watershed.

The installed project will provide some floodwater and sediment damage reductions to operators of agricultural land on the Canadian River flood plain downstream from the confluence of Red Deer Creek and the Canadian River.

An evaluation of installing the planned land treatment measures was not made in monetary terms. Experience has shown that conservation measures are essential to maintaining the productivity of the soil and that the cost of protecting the resource is a part of the production cost.

A summary of economic findings is attached as Appendix A.

FAVORABLE ENVIRONMENTAL EFFECTS

Installation of the project will:

1. Reduce upland erosion and flood discharges.
2. Increase efficiency of use of irrigation water.
3. Provide flood protection to 7,960 acres of flood plain land by reducing average annual flooding by 57 percent.
4. Reduce sediment contributed to the flood plain by 64 percent and reduce volume of sediment delivered to the Canadian River by 50 percent.
5. Reduce streambank erosion on the flood plain by 74 percent and in the uplands by 29 percent.

6. Provide flood protection to the cities of Miami and Canadian.
7. Alleviate sediment encroachment on bridges and roadbed of the railroad, highways, and roads on the flood plain.
8. Reduce wind erosion problems.
9. Reduce floodwater, sediment, and erosion damages by 63 percent to crop and pasture; 62 percent to other agricultural; 95 percent to the railroad; 77 percent to roads and bridges; 74 percent to overbank deposition; and 43 percent to streambank erosion.
10. Provide beneficial incidental recharge of the ground water aquifer for irrigation use.
11. Provide beneficial incidental recharge of the ground water aquifer for discharge as spring flow in Red Deer Creek valley.
12. Create surface water areas for waterfowl resting and feeding, fish habitat, and drinking water for wildlife.
13. Improve wildlife habitat in the flood plain area for ground-nesting species and fur animals.
14. Improve the wildlife habitat value of cropland for gamebirds.
15. Improve the habitat for the threatened lesser prairie chicken on rangeland.
16. Increase agricultural efficiency on flood plain lands.
17. Increase income to households in the immediate locale by \$86,240 annually.
18. Create the equivalent of 13 permanent jobs through increased demand for goods and services, which will reduce unemployment in the local area.
19. Create approximately 99 man-years of employment during the installation period of structural measures.
20. Provide some protection from floodwater and sediment damages on the Canadian River.

ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

Installation of the project will:

1. Require the temporary destruction of vegetation of 230 acres of rangeland used primarily for grazing livestock with a secondary use by wildlife.
2. Require that the land use be changed on 337 acres of rangeland and 129 acres (15 miles) of dry streambed.
3. Occasionally interrupt the present use on 2,079 acres of land.
4. Restrict the land use on the 2,775 acres of land needed to install the floodwater retarding structures.
5. Result in a minor reduction in runoff at the Canadian River initially because of seepage and evaporation losses in the sediment pools. However, the magnitude of this impact will diminish as the pools fill with sediment.
6. Destroy 17 known archeological sites ranging from temporary campsites to large permanent villages and require precautionary action to prevent damage or destruction of 8 additional archeological sites and one paleontological site.

ALTERNATIVES

The considered alternatives to the proposed action were: (1) an accelerated program of applying land treatment measures, relocating improvements out of the flood hazard area, and restricting new construction in the flood hazard areas; and (2) foregoing the implementation of a project.

A discussion of each alternative follows:

Alternative No. 1 - Alternative No. 1 consists of applying the land treatment measures as proposed in the project action, relocating as many of the improvements out of the flood hazard areas as possible, and restricting new development into the flood hazard areas.

This alternative consists of relocating 33 residences and 7 business and commercial enterprises in the urban areas of Canadian and Miami, and 6.86 miles of railroad track. Any new construction in the flood hazard areas would be restricted.

Most of the impacts of applying land treatment measures are discussed under "Environmental Impact." The average annual damages to the agricultural land would be reduced by about three percent. The average annual sediment load carried into the Canadian River would be reduced from 148,000 tons to 140,000 tons, a reduction of nine percent. However, there would be very little reduction in erosion and sediment production from the geologically unstable gullied and Badlands-like areas of the watershed.

The relocation of 6.86 miles of railroad track of the Atchison, Topeka, and Santa Fe Railway Company would cost an estimated \$3,240,200. The annual equivalent value of the \$3,240,200 cost of relocation, amortized for 100 years, is \$191,010. This will reduce the present estimated average annual damage to the railroad from \$255,400 to \$64,390. This would require about 80 acres of rangeland to be taken out of agricultural production for relocating the tracks, in addition to requiring changes and adjustments in the use of the land surrounding this change. The loss of production could be offset by reclaiming the abandoned roadway for agricultural production by reestablishment of rangeland vegetation.

Urban damages in Miami and Canadian could be reduced by relocating 33 residences and 7 businesses. Damages to other improvements such as roads and bridges, utility lines, park improvements, etc., would be foregone.

Selection of this alternative would eliminate the adverse impacts caused by the installation of the structural measures; however, the opportunity to realize favorable impacts such as the creation of surface reservoirs, incidental recharge benefits, etc., would be foregone.

This alternative would reduce present average annual damages from \$471,670 to \$267,840.

This alternative would allow the physical processes of flooding, sedimentation, and erosion to continue to damage the soil, water, and related resources in Red Deer Creek valley at essentially the same rate.

The estimated cost of this alternative is \$5,135,000.

Alternative No. 2 - Alternative No. 2 consists of foregoing the implementation of a project.

This would delay the application of land treatment measures and the impact these measures have on the renewal and improvement of the soil, water, fish, and wildlife resources. However, it is

reasonable to expect that the landowners and operators would eventually install the land treatment measures to maintain the productivity of their lands.

Foregoing implementation of the project would allow the physical processes of flooding, sedimentation, and erosion to continue. The damages associated with these processes are described under "Water and Related Land Resource Problems." The frequency and areal extent of flooding will increase as the channels fill with sediment, thereby causing damages to increase over the present rate. The processes of flooding, sedimentation, and erosion cause an estimated \$471,670 in average annual damages.

The relocation of the 6.86 miles of railroad track which is planned in the event that the project is not implemented would require about 100 acres of land and cause adverse impacts similar to those expected to occur as a result of installing the floodwater retarding structures.

This alternative would eliminate the adverse impacts caused by installing the floodwater retarding structures. However, the opportunity to create 466 acres of surface water which could be used by fish and wildlife would be foregone. Also the opportunity for incidental recharge of the ground water aquifer would be lost.

The opportunity to realize about \$343,710 in average annual net benefits would be foregone.

SHORT-TERM VS. LONG-TERM USE OF RESOURCES

Most of the land in the watershed is used primarily for agricultural production and this use is not expected to change appreciably. Urban growth will be confined mainly to Pampa and this growth will undoubtedly be governed by the production of petroleum. The level of protection provided by the project on the flood plain is adequate for present and expected future uses. Flood protection from up to and including a 100-year storm event is provided for the flood plain improvements in Miami and the improvements in Canadian with proper maintenance of the existing levee. Very little future development in the flood plain of the urban areas is anticipated. Protection provided the railroad, an important east and west link in the nation's transportation system, and to the adjoining highway is adequate.

Capacity provided for sediment accumulation in the sediment pool and detention pool for the 100-year period will have a stabilizing effect on the unstable steep uplands. This stabilization is expected to

occur to points well upstream from the impoundment areas as sediment accumulation reduces stream gradients and fills the deep, eroding channels and gullies. This will reduce the future volume of sediment reaching and being deposited in the structure pools and will provide stabilized points into the upland areas from which smaller, less costly stabilization measures can be installed in the future.

The Red Deer Creek watershed lies within the Arkansas-White-Red Water Resource Region. Red Deer Creek is a tributary of the Canadian River and enters the river about 25 miles upstream from the Texas-Oklahoma state line and about 400 miles upstream of the Eufaula Reservoir, the first major downstream reservoir. Lake Meredith, a large municipal and industrial water supply reservoir, lies about 70 miles upstream on the Canadian River.

The present status of the watershed program in the intervening area between Lake Meredith and Eufaula Reservoir is as follows: two watershed projects approved for operation and construction under way, one watershed currently being planned, two watershed project applications for planning assistance received, and one watershed project where planning assistance has been terminated. Red Deer Creek watershed is the only watershed located within the Texas portion of the Canadian Basin on which it appears a watershed project will be developed. It is estimated that the cumulative impacts of these watershed projects will be insignificant because of the small number and the fact that they are widely dispersed.

Installation of the structural measures will result in the destruction of the existing vegetation and wildlife habitat on 696 acres of land (this acreage includes 129 acres of dry streambed) during the 10-year installation period. About 230 acres of this land will be revegetated immediately after construction is completed. The remaining area will be inundated by water for short periods of time in structures located in sand and gravel bedrock areas of the Ogallala Formation to year-round in several structures located in clayey bedrock in the upper reaches of the watershed. Some natural revegetation with annual weeds, etc., will probably occur in areas of the pools which are inundated for only short periods of time.

Installation of the structural measures will cause the destruction of some archeological resources. However, the most valuable archeological resources occur in the main valley of Red Deer Creek. These resources will not be disturbed but will receive protection from possible damage and destruction by streambank erosion and the constant shifting of the stream channels.

With the proposed project, the long-term habitability and contribution to the economic well-being of the area will be improved with only minimal detriment to a few features of the existing environment. In total,

the natural environment and aesthetic values of the area will be benefited over those that would exist in the long term without project measures.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Construction of the project will require change in the use of 567 acres of rangeland and 129 acres (15 miles) of dry streambed for the dams and emergency spillways and area inundated by the sediment pools. Another 1,900 acres of rangeland and 179 acres (23 miles) of dry streambed will be subjected to interrupted use because of temporary inundation by floodwater in the retarding pools.

Runoff from the watershed into the Canadian River may be reduced by about less than three-tenths of one percent initially after project installation by seepage and evaporation losses. This loss will decline to pre-PL 566 project conditions as sediment accumulation encroaches on the sediment pool storage capacities.

Installation of the project will also require the commitment of labor, materials, and energy for construction. No other commitment of resources is known to be required for this project.

CONSULTATION WITH APPROPRIATE FEDERAL AGENCIES AND REVIEW BY STATE AND LOCAL AGENCIES DEVELOPING AND ENFORCING ENVIRONMENTAL STANDARDS

General

The application for assistance for the Red Deer Creek watershed was submitted to the Secretary of Agriculture through the Texas State Soil and Water Conservation Board (designated state agency). A field examination was made by the Soil Conservation Service and representatives of appropriate state agencies to determine that, within the requirements of national standards, there were no apparent obstacles to planning and carrying out a watershed project. The Texas State Soil and Water Conservation Board held a public hearing to solicit public reaction. The board then recommended that the Soil Conservation Service furnish planning assistance.

The work plan was developed in full consultation and cooperation with all interested agencies and individuals. Written notification of initiation of work plan development was sent to all federal, state, and local agencies that might have an interest in the project, soliciting information and comments. Contacts were made with several of these agencies during planning to obtain information and assistance.

A representative of the Texas Forest Service made a reconnaissance of the watershed to determine if there were any forest management possibilities.

The Fish and Wildlife Service, U. S. Department of the Interior, prepared a reconnaissance report on the Red Deer Creek watershed, describing the fish and wildlife resources in the project, the effects of the proposed project, and recommendations for maintaining and enhancing the fish and wildlife resources of the watershed. All recommendations were used in the formulation and design of the project.

The Texas State Historical Commission furnished information on known archeological sites of scientific value and historical sites either listed in or nominated to the National Register of Historic Places. The Archeological Research Laboratory, Killgore Research Center, West Texas State University, Canyon, Texas, made an archeological survey of the watershed under funding by the National Park Service.

Representatives of the sponsoring local organizations contacted landowners for permission to survey, and to explain how the program would affect their lands. Owners of pipelines, utility lines, etc., were contacted to determine what modifications, if any, would be necessary to their improvements when the project was installed. The sponsors carried on an active public information program, including public meetings, in an effort to explain the program and solicit public reaction and participation as the project was formulated.

All interested agencies were invited to informally review the work plan and a preliminary draft environmental statement (subject to revision) and offer any suggestions for improvement. The work plan and draft environmental statement have been prepared in consideration of such comments and recommendations as were provided by the agencies who reviewed the plan.

Discussion and Disposition of Each Comment on Draft Environmental Impact Statement

The following federal, state, and local agencies and groups were requested to review and comment on the draft environmental impact statement:

- U. S. Department of the Army
- U. S. Department of Commerce
- U. S. Department of Health, Education, and Welfare
- U. S. Department of the Interior
- U. S. Department of Transportation
- Advisory Council on Historic Preservation
- Environmental Protection Agency
- Federal Power Commission

Division of Planning Coordination (state agency designated by
Governor and state clearinghouse)
Panhandle Regional Planning Commission

All of the above agencies, with the exception of the U. S. Department of Commerce and the Federal Power Commission, responded. The comments and disposition for each is as follows:

U. S. Department of the Army

Comment: The Department did not foresee any conflict with any of its projects or current proposals and considered the draft environmental statement as being satisfactory.

Response: Noted.

U. S. Department of Health, Education, and Welfare

Comment: The Department stated that their review of the draft environmental statement for the project discerned no adverse health effects, provided that appropriate guides are followed to concert with state, county, and local environmental health laws and regulations.

Response: Noted.

U. S. Department of the Interior

Comment: The Department stated that the work plan reflected adequate consideration of the fish and wildlife resources and was pleased to note that it contained specific language implementing six recommendations made by the Department.

Response: Noted.

Comment: The Department advised that the designation "threatened" has recently been substituted for the previously used designations of "rare" or "endangered" in Threatened Wildlife of the United States, Resource Publication 114, March 1973.

Response: References to appropriate species were changed to reflect this change.

Comment: The Department suggested that clarification of evaporation losses is needed since evaporation was expected to be low

from the floodwater retarding structures while being high from a reservoir for impounding water for municipal storage.

Response: Evaporation rates in this area are high. However, evaporation losses will be low from most of the floodwater retarding structures because of fast drawdown of the floodwater from the detention pools and the rapid seepage losses from the sediment pools. Rapid seepage will cause pools to be small in size or dry much of the time. Evaporation losses from a large permanent body of water, such as would be required to provide a dependable water supply for recreation or municipal use, would be high because of the large surface area of water constantly subject to evaporation.

Comment: The Department noted that the work plan and environmental statement recognized the existence of both oil and gas production and continuing exploration. Also that the proposed project would not interfere with petroleum or other mineral production and that existing pipelines in the pool areas of two floodwater retarding structures would be relocated.

Response: Noted.

Comment: The Department stated that no mention is made of the possibility of improperly plugged dry or abandoned oil or gas wells within the pool areas of the sites, nor is any explanation given for plans to alleviate any pollution problems that may arise from such wells.

Response: A section has been added to the environmental statement to point out that the one well which was found and mapped in the process of making engineering studies has been registered as being properly plugged with the Texas Railroad Commission (the responsible state agency). Further search at each floodwater retarding site location did not reveal the existence of any other abandoned or dry wells.

Comment: The Department suggested that the final environmental statement include discussions on the significance of archeological and paleontological sites in relation to the works of improvement.

Response: The Archeological Research Laboratory, Killgore Research Center, West Texas State University, Canyon, Texas, is in the process of completing a detailed archeological survey

of the watershed. They have prepared an interim report of the archeological resources which will be affected by the project for inclusion in the work plan and environmental impact statement. A description of archeological resources to be affected, the impacts, and cost estimate for salvage of affected resources have been included in the work plan and the environmental impact statement.

Comment: The Department stated that the project will not adversely affect any existing, proposed, or known potential unit of the National Park System, or any known historic, natural, or environmental education sites eligible for the National Landmark Programs.

Response: Noted.

Comment: The Department noted that the sediment pool of floodwater retarding structure No. 2 is planned so as to not impound water. However, the Project Map (Appendix B) shows a dark blue pattern for the sediment pool that apparently represented a permanent pool. They suggested that the blue patterns on the map should be identified more fully in the legend and the plan for structure No. 2 should be clarified.

Response: The map symbol used for floodwater retarding structures on the project map is a standard symbol. The blue cross-hatched area denotes detention pool area and the dark blue denotes the area reserved for expected accumulation of sediment. This has no relationship to the elevation of the lowest ungated outlet except when they are the same. When there is planned storage of water included in a floodwater retarding structure for a particular use, a different map symbol is used. This symbol shows the area of the planned water storage in red. As stated in the comment, the text and the tables of the plan and statement clearly indicate the plan for floodwater retarding structure No. 2.

Comment: The Department observed that more than 4 million cubic yards of compacted fill would be required for the 20 structures. The Department stated that the only mention of the composition of the fill is that it would be obtained from spillway excavation, at least in part, and since the composition of the fill material appears to have a very wide range in composition it would be advisable to provide more information on the planned composition of the structures, including acceptable limits of materials suitable for the fill.

Response: A summary paragraph on foundation conditions and composition of materials has been taken from the work plan and included in the environmental statement. The work plan points out that detailed investigations for final designs are made prior to construction.

Comment: The Department questioned the use of a 90 percent trap efficiency for clayey sediments and 95 percent trap efficiency for sandy sediments in the work plan. It is stated that these figures are important because one of the purposes of the structures is to reduce the deposition of damaging sandy sediment on the flood plain and that the project is expected to reduce sandy sediment deposition on the flood plain by 64 percent. The Department indicates that the 5 percent difference in trap efficiencies for sand and clay are too small and that it would be helpful to explain the basis for selection of these values and to define the approximate grain sizes referred to in these calculations.

Response: The trap efficiency figures of 90 percent for clayey sediment and 95 percent for sandy sediment are values used as one step of several steps in arriving at the design of sediment storage areas for floodwater retarding structures to insure a life expectancy of at least 100 years. These are generalized figures that recognize that more fine material would be subject to passing through the principal spillway of a structure located in a drainage area producing clayey sediment (more than 50 percent of the material smaller than 0.05 millimeters) than one located in a sandy sediment producing area (more than 50 percent of the material larger than 0.05 mm.).

Trap efficiency figures, delivery ratios, and allocation of the estimated volume of sediment expected to accumulate in the various pools over a 100-year-period life in a floodwater retarding structure were developed from available, but limited, research data; knowledge of how sediment accumulates in conventional reservoirs; and judgment to allow for the differences in the way conventional reservoirs and floodwater retarding structures operate. There are no existing floodwater retarding structures with 100-year or even 50-year life spans. Research by the Agricultural Research Service on the functioning of existing older floodwater retarding structures indicates that the values being used for design of sediment pools are adequate for estimating sediment deposition within floodwater retarding structures. Periodic sediment surveys are being made on 29 functioning floodwater

retarding structures selected within the various land resource areas in the state. The results of these surveys are reviewed to check the annual rate of deposition, changes in sediment production in the uplands due to changes in land treatment and land use, treatment of gullies and other sediment source areas, etc. With allowances for changes in sediment production due to land use change from cropland with high sediment production to grassland with low production, the sediment surveys support the adequacy of these design procedures in estimating sediment accumulations.

Comment: The Department stated that they have reservations with regard to the discussions of incidental recharge benefits. These reservations are (1) there is no indication how the amount of recharge was determined, and (2) that 1,330 acre-feet of recharge would be expected to be recovered by 30 irrigation farmers. It is further stated that in order for the irrigation wells to benefit from the recharge, the wells would necessarily have to be in the immediate vicinity of the recharge structures and that it would seem that any recharge effects would tend merely to sustain springflow immediately downstream.

Response: A generalized summary of the methods used in making ground water investigations and estimating recharge of the Ogallala Formation is contained in the work plan. A ground water work map was developed showing locations of wells, springs, and contours of the water table. Data for the map was obtained by field studies and from published data contained in Geology and Ground Water Resources of Carson County and Parts of Gray County, Texas, Bulletin 6102, Progress Report No. 1, Texas Board of Water Engineers, March 1961, and in Reconnaissance Investigations of the Ground Water Resources of the Canadian River Basin, Texas, Bulletin 6016, Texas Board of Water Engineers, September 1960.

An operation study of the inflow, evaporation, and seepage losses in the sediment pools and detention pools was made for the historical period 1941 through 1957 to arrive at estimated annual seepage losses that would be expected from the pools initially after construction and for various stages of expected filling of the sediment pools until the end of the life of the pools. This study took into account the surface area of the pools and depth of water initially after construction and at various stages through the life of the sediment pools. The

infiltration rates were based on the nature and thickness of the blanket of "sealing" sediment expected to be deposited over the existing materials under the pools. The volume of seepage lost from the pools was adjusted to estimate the amount that would become available for recovery and the amount that would return to Red Deer Creek in the form of spring flow. The volume estimated to be recoverable was further reduced to allow for less than 100 percent recovery.

Floodwater retarding structures Nos. 1 through 12 were found to be in favorable locations to contribute to recharge of the aquifer and be recoverable by irrigators. Part of the seepage from these structures was considered as possibly not becoming available for recovery for recharge and would return as spring flow to Red Deer Creek. All of the seepage from floodwater retarding structures Nos. 13 through 20 is expected to return as spring flow. It should be noted that structure No. 2, which was designed with a "dry" sediment pool, will have a very minor effect on recharge. Similarly, no allowance was made for possible recharge in the Red Deer Creek channel upstream from Miami by the prolonged release flows from the retarding pools as this reach presently serves as a recharge area for recharge of the sewage effluent from the Pampa treatment plant.

The evaluation did not assume that all 30 irrigation farmers would receive equal portions of the expected recharge. However, all would benefit from the reduced rate of depletion of this resource.

Comment: The Department stated that the environmental statement presents too optimistic a view of the project's potential beneficial effects on fish and wildlife since these effects are based on land users applying measures designed primarily for benefit of fish and wildlife. Further, it is not logical to make the assumption that these measures would be applied without some binding certification.

Response: It is true that the conservation program and conservation idea has been and still is basically a voluntary action on the part of the general public. Proof of success of this voluntary effort by landowners is the large amount of conservation work that has been applied through the locally controlled soil and water conservation districts. While it is true that some conservation practices show direct economic returns and that cost-share help is often available,

it is also true that the landowner has to commit his own resources for applying these practices and that some practices provide no return other than preserving and enhancing the land for future generations. The expected benefits to fish and wildlife resources is based on this type of concern for natural resources by the landowners. It should also be noted here that the application of the nonstructural land treatment measures is a continuous or on-going process that must be repeated every year and is not a one-time process that has everlasting results.

Comment: The Department stated that the effects of the project on archeological resources could be adverse, cumulative, and irreversible and should be discussed in the relevant sections. Also that measures to mitigate the adverse effects should be described.

Response: The effects of the installation of the project on archeological resources has been included in the final environmental impact statement. Information for describing the impacts and cost of mitigation of archeological resources affected by installation of the project measures was obtained from an interim survey report prepared for the Soil Conservation Service by Dr. Jack T. Hughes of the Archeological Research Center of West Texas State University. The archeological survey was funded by the National Park Service.

Comment: The Department stated that the discussion on vegetation in the watershed leaves the reader with the impression that all woody plants are considered as undesirable as they will crowd out grass if left uncontrolled and that retention of woody plants is needed to retain habitat for wildlife.

Response: The discussion on woody vegetation on native grasslands was modified to state that continued overgrazing and overuse of rangeland results in complete takeover of the rangeland by woody species such as mesquite, yucca, sand sagebrush, juniper, salt cedar, and baccharis. The purpose of planning and applying brush management on rangeland is to eradicate these species of invading brush from portions of the rangeland to be restored to the original native vegetation and to retain some woody vegetation for needs of wildlife species. This measure is discussed in the "Planned Project" section of the environmental statement.

Comment: The Department suggested that "threatened" be substituted for "rare" or "endangered" as designated in Threatened Wildlife of the United States, Resource Publication 114, March 1973. They also suggested the presence or absence of the swift fox should be clarified.

Response: The work plan and the environmental impact statement were both revised, substituting "threatened" for "rare" or "endangered" as suggested. Updated listings for Texas were consulted to determine the status of the swift fox. In the process, it was determined that the swift fox is not found in the watershed and that the black-tailed prairie dog is no longer listed in Texas as threatened. For these reasons references to the swift fox and the black-tailed prairie dog were deleted from the plan and the statement.

Comment: The Department suggested that the final statement should contain a sentence indicating that the National Register of Historic Places has been consulted and if National Register properties will be affected.

Response: This statement has been added.

Comment: The Department suggested that the discussion on wildlife upland habitat management practices under the "Planned Project, Land Treatment Practices" section be expanded to include acreages which could be strip-plowed, fenced areas of plantings for wildlife food production, supplemental feeding of wildlife, and watering spots to be constructed.

Response: The discussion on wildlife upland habitat management practices has been revised slightly to more correctly describe the type of practices that are needed on the 84,000 acres of land expected to be treated and that will be recommended to the land users. The type and exact amounts of the various types of these practices that will be planned and applied by the land user receiving planning assistance during the project installation period is not known as this decision must be and is made by each land user.

Comment: The Department suggested that the statement include a discussion of the possibility of an accelerated eutrophication rate of ponds due to fertilization from feedlot, warmup pen, and crop runoff.

Response: There is no reason to believe that accelerated eutrophication of ponds will result from the installation of the

project. Existing ponds are not affected by accelerated eutrophication. Any increase in the use of fertilizers on cropland will not affect ponds as the cropland lies on the High Plains portion of the watershed and most of the ponds are located in the Rolling Plains area of the watershed.

Comment: The Department stated that there appears to be a contradiction between the data contained in the environmental statement and data contained in the work plan. A sentence in the environmental statement states that "Increase in the density of grasses and forbs on treated rangeland will improve the quality of habitat for the lesser prairie chicken; however, it will not be advantageous to dove and quail..." The sentence from the work plan states that "The vegetative conditions which are expected to improve the habitat for the lesser prairie chicken in new areas of the watershed will have a detrimental effect as a habitat for doves and quail. These detrimental effects, however, will be offset by strip plowing of soil areas in grassland for forbs and other seed producing vegetation." The Department suggests that some clarification of the project's effects on dove and quail habitat and of the value of forbs to doves and quail be added.

Response: There does not appear to be a contradiction between these sentences as to the value of forbs to doves and quail. However, there does appear to be some question as to the value of natural grassland vegetation for various species of wildlife. Many biologists contend that grassland in its natural state is ideal habitat for the lesser prairie chicken but is not ideal habitat for dove and possibly quail. Furthermore, the deterioration of this natural vegetation by overgrazing, overuse, etc., results in reducing the value of the grassland as habitat for the lesser prairie chicken while increasing its habitat value for dove and quail. This assumption is based on the observation that weeds and brushy vegetation increase on grassland which is subjected to deterioration of the natural vegetation.

The goals of rangeland conservation treatment measures are to restore and maintain the vegetative composition of the natural grasslands in order to conserve this resource while, at the same time, protecting the soil and water resources. The wording of the sentences in question in both documents has been revised slightly as follows:

Increase in density of grasses and forbs on the treated rangelands will improve the quality of habitat for the lesser prairie chicken. Should the forb growth on the treated rangelands prove to be inadequate for the needs of doves and quail, soil disturbance by discing and chiseling would be encouraged. Two or three such disturbed areas of 5-acre plots per 640 acres of rangeland would be adequate to provide the forbs for doves and quail.

It should be pointed out that the discing would be performed as a practice under wildlife upland habitat management, a land treatment practice discussed in a previous response to a comment.

Comment: The Department suggested that data should be added to reflect the possible adverse effects of rising water tables on colonies of prairie dogs.

Response: The environmental statement contained the sentence, "Two known prairie dog colonies lie outside of the construction and impoundment areas of the floodwater retarding structures." This sentence has been deleted since the prairie dog is not on any threatened list. These colonies would not be affected by rising water tables.

Comment: The Department stated that the draft environmental statement did not deal substantively with impact of the proposed project on archeological resources and thus did not comply fully with the requirements of the Council on Environmental Quality's guidelines for environmental statements. They further stated that a survey by a competent professional archeologist is needed to provide the basis for evaluating the effects of the proposed action. Also that the archeological report and its author should be cited in the environmental statement.

Response: A detailed archeological survey is being made of the watershed by Dr. Jack T. Hughes of the Archeology Research Laboratory of West Texas State University under funding of the National Park Service. A special interim report for inclusion in the environmental impact statement has been completed for use of the Soil Conservation Service. This report and its authors have been cited. Information on location of archeological sites that may be affected, description, effects of project installation, and mitigation

costs for salvage of archeological resources that will be affected have been included in the final environmental impact statement.

Comment: The Department stated that the long- and short-term favorable impacts were covered, but the short range adverse impacts need more coverage. They state that surface disturbance from application and installation of project measures may have short-term adverse impact on soil, water, and wildlife resources. Such impacts warrant analysis and identification in the statement.

Response: The section titled "Short-Term Vs. Long-Term Uses of Resources" has been modified to show that installation of the structural measures will result in loss of vegetative cover and habitat during the period of time between start of construction and the reestablishment of vegetation. A paragraph on the loss of archeological resources has also been added.

Comment: The Department suggests that the final statement contain a section which is devoted to identifying and discussing the measures which will be employed to mitigate adverse effects.

Response: Our analysis of the impacts resulting from project installation does not indicate any adverse impacts of a severity or scope which would warrant the inclusion, as part of the planned project, of measures specifically for mitigation except those relative to the protection, preservation, or recovery of archeological resources. Measures included to minimize adverse impacts resulting from project installation are discussed under "Planned Project." An additional section included for the purpose of further discussing these measures is not considered necessary.

Comment: The Department stated that the adverse impacts section should be expanded to discuss, and if possible, quantify the loss of dove, quail, pheasant, and antelope habitat that will occur as a result of implementing these project features.

Response: There will not be any loss of habitat for pheasant and antelope and, in fact, the habitat would be improved for antelope as it is primarily a natural grasslands animal. The possibility of reducing dove and quail habitat by restoration of the natural vegetation on degraded rangeland is included in the "Environmental Impacts" section. It is felt

that practices expected to be applied as part of the wild-life upland habitat management practice will improve the overall habitat conditions in the watershed and will offset any loss of dove and quail habitat on the natural grasslands.

Comment: The Department expressed the belief that the alternative section could be expanded to reflect another real alternative to the recommended project. They further stated, ". . . the implementation of a proper livestock grazing management program with sound agricultural practices could be carried out without need for other project measures. Success in improving vegetation density and composition has been achieved in other areas by initiating a good livestock management grazing program without brush conversion and seeding."

Response: The land treatment measures contained in the selected plan attest to the beneficial effects of sound agricultural practices and good livestock management grazing programs in enhancing and maintaining the natural vegetation on the grasslands of the watershed. The alternatives included in the statement are addressed to applying only the land treatment measures as one alternative and foregoing the implementation of all structural measures contained in the selected plan. We do not concur that a good livestock management program that will protect soil resources and at the same time be economically sound can be carried out without brush management and range seeding on land where infestation by woody plants is a serious problem.

U. S. Department of Transportation

Comment: The Department had no comment nor objection to the project.

Response: Noted.

Advisory Council on Historic Preservation

Comment: The Advisory Council determined that the draft environmental statement was procedurally adequate. However, they suggested that a copy of the State Historic Preservation Officer's comments concerning the effects of the undertaking upon historical and archeological resources be included in the final environmental impact statement.

Response: The comments of the Texas State Historical Commission and actions taken are included under the comments of the Division of Planning Coordination (state agency designated by Governor and state clearinghouse).

Environmental Protection Agency

Comment: The Agency stated that the environmental statement and work plan adequately discuss most of the impacts from the proposed watershed project.

Response: Noted.

Comment: The Agency suggested that the summary sheet for the work plan should more clearly define that more than half of the flood reduction benefits will accrue to the private corporation, the Atchison, Topeka, and Santa Fe Railway Co., and that the alternative of relocating the railroad, possibly with some type of government assistance, should be discussed and the impacts described to strengthen the environmental statement.

Response: The summary sheet of the work plan was revised to more clearly reflect damage reduction to the Atchison, Topeka, and Santa Fe Railway Co. and Alternative No. 1 in the environmental statement was revised to more clearly describe the impacts of relocating the railroad.

Comment: The Agency stated that the final environmental statement should discuss the effect of the cancellation of the Agricultural Conservation Program on the application on land treatment measures, with particular emphasis on the effects on planned fish and wildlife development.

Response: A new cost-share program, the Rural Environmental Conservation Program, has been initiated to achieve conservation treatment for improvement of the environment and for development of fish and wildlife improvements. Therefore, a discussion of the effects of cancellation of the Agricultural Conservation Program was not deemed necessary.

Comment: The Agency requested that a discussion of methods to be used for control of brush on 28,200 acres of land infested with mesquite and other undesirable vegetation be included in the statement. Also that names of chemicals be listed, if chemical control is used, along with the federal registration and intended use.

Response: The discussion on land treatment measures to be applied under the title of "Planned Project" has been expanded to show acreages of various types of undesirable vegetation expected to be controlled by the land users and the methods of control

for the various types of plants. It was pointed out that where technical assistance is provided by the Soil Conservation Service, chemical control for control of sand sagebrush would be by use of chemical agents approved fully and registered for the intended use at the time of application.

Comment: The Agency asked if the \$24,900 of benefits to irrigation farmers from incidental recharge represent benefits during the first year after project completion, or an average discounted value over the life of the project.

Response: The \$24,900 of benefits to irrigation farmers from incidental ground water recharge is an average discounted value over the life of the project (Appendix A).

Division of Planning Coordination (state agency designated by Governor and state clearinghouse)

The Division stated that the reviewing state agencies generally found that the draft environmental statement complied with the intent of the National Environmental Policy Act. Copies of the letters of comments by these agencies were furnished for consideration. The comments from the reviewers and the responses made to the comments are as follows:

Comment: The Texas Water Development Board suggested that the sponsors of the Red Deer Creek project discuss the work plan with the Canadian River Compact Commissioner of Texas.

Response: The Soil Conservation Service provided the Canadian River Compact Commission a copy of both the watershed work plan and the environmental impact statement for review and comment. The Compact Commissioner (Texas) was also contacted personally. A formal response has not been received. However, the Commissioner has advised that no conflict was foreseen.

Comment: The Bureau of Economic Geology stated that a delicate balance exists between stream discharge and sediment load and that there would not likely be a reduction in sediment load to the Canadian River without a proportional decrease in water discharge.

Response: Installation of the floodwater retarding structures will change the flow patterns and thus the energy patterns in Red Deer Creek. Installation of the project will reduce the depth, associated velocity, and duration of out-of-channel flows and increase the duration of low flows within the channels. The velocity of the flows will still be sufficient to move bedload; however, the velocity of flows

resulting from remaining flooding will fall within the range of velocities that are stable on the existing flood plain vegetation. The Schoklitsch Equation was used to study bedload movement before and after project installation. Information on depth, slope, duration, grain size, and width of channel was utilized in the application of this equation.

Comment: The Bureau of Economic Geology recommended that additional engineering geology studies be made of the foundations.

Response: The work plan states that detailed geologic investigations with core drilling equipment and sampling for laboratory studies are made at all floodwater retarding structures prior to final engineering design and construction.

Comment: The Texas State Historical Commission stated that a preliminary field reconnaissance, intensive archeological survey, and scientific recovery program should be initiated to mitigate the adverse effects of the project.

Response: A reconnaissance archeological survey has been made and information on cost for salvage of affected archeological resources included in the work plan and environmental impact statement. A detailed archeological survey of the watershed is scheduled to be completed by mid-1975.

Comment: The Texas Water Rights Commission noted that the time-frame for construction of the project coupled with rising costs and other economic factors could have adverse effects on project installation.

Response: The 10-year installation period for the project is generally not considered as being excessive for a project of this scope. Also, installation of the project will be contingent on the availability of funds.

Comment: The Texas Water Rights Commission noted that additional study should be given to the question of aquifer recharge, especially the sealing of the pools by sediment.

Response: Estimates of recharge from the pools took into account the probable effects of the sealing effects of sediment, the increasing thickness of this deposition, and the decreasing volume of water that would be available as the sediment accumulates in the sediment pools.

- Comment: The Texas Water Rights Commission questioned the possibility of increase in undesirable phreatophytic vegetation due to recharge of the aquifer and spring flow.
- Response: Undesirable phreatophytic vegetation is a problem on the subirrigated flood plain of Red Deer Creek. This problem is intensified by flooding and sedimentation which destroys existing native prairie vegetation over broad areas following the larger floods. The phreatophytic plants make a quicker recovery on these areas than the native grasses. Ranchers control these plants by mowing or shredding. It is expected that the stabilizing effects resulting from reduced sedimentation and flooding will enable the ranchers to do a more effective job in controlling these plants and restoring the native prairie meadows on the flood plain.
- Comment: The Texas Water Rights Commission stated that special clarification is necessary regarding the effects of adding increased acreages to the present inventory of irrigated cropland and the effects of increased grazing on new rangeland in the geologically unstable areas of the watershed.
- Response: The work plan does not anticipate any new lands being placed into irrigation but recognizes that more efficient use and greater productivity can be achieved within the present land uses with project installation. Improvement of the vegetative cover on the rangeland of the watershed is anticipated with application of the land treatment measures and will help achieve a reduction in erosion on these lands.
- Comment: The Texas Water Rights Commission stated that further explanation should be furnished on the rationale leading to the predictions and estimates of the effects of evaporation and seepage losses in sediment pools of the floodwater retarding structures in average annual volume of streamflow in Red Deer Creek and the Canadian River.
- Response: Detailed studies of individual floodwater retarding structures were made to determine the effects on downstream water resources. Based on geologic investigations, the floodwater retarding structures were grouped into high, medium, or low seepage, and rates were computed using Darcy's formula. The computed seepage rates for individual structures follows:

<u>Structure Site Number</u>	<u>Seepage Rate</u>
1, 2, 3, and 4	.005
7, 10, 12, and 14	.025
5, 6, 8, 9, 11, 13, 15, 16, 17, 18, 19, and 20	.075

An analysis of historical rainfall for normal rainfall periods indicated that the average annual runoff at the structure sites would be 0.94 inch. The channel loss factor from the Soil Conservation Service National Engineering Handbook, Section 4, Hydrology, for Red Deer Creek watershed would be 0.54. Thus, the average annual outflow from the watershed before installation of the project is estimated to be 0.51 inche of runoff, or 8,960 acre-feet.

A summary of the results of the geologic and hydrologic studies is shown in the following tabulation:

Condition - Items	: Estimated Average Annual Runoff (Ac. Ft.)		
	: At	:	: Adjusted Volume
	: Structure	: Flow Into	: Leaving
	: Pools	: Streams	: Red Deer Creek ^{1/}

WITHOUT PROJECT

Uncontrolled Drainage Area (331.0 sq. mi.)	xxx	16,595	8,960
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WITH PROJECT (IMMEDIATELY AFTER INSTALLATION)

Uncontrolled Drainage Area (136.36 sq. mi.)	xxx	6,837	
Controlled Drainage Area (194.64 sq. mi.)	9,758		
Annual Outflow from Spillways	4,501	4,501	
Annual Loss from Pools from Evaporation	455		
Annual Loss from Pools by Seepage	4,802		
Net Annual Recharge Recoverable from the Ogallala by Irrigators	1,330		
Water Remaining in Aquifer or Returned to Stream by Springs	3,472		
Estimated Return as Spring Flow into Streams (Lower Red Deer Creek)	3,136	3,136	
TOTAL WITH PROJECT - IMMEDIATELY AFTER INSTALLATION		14,474	7,816

WITH PROJECT (AFTER ALL LOWEST UNCATED POOLS ARE FILLED WITH SEDIMENT)^{2/}

Uncontrolled Drainage Area (136.36 sq. mi.)	xxx	6,837	
Controlled Drainage Area (194.64 sq. mi.)	9,758		
Annual Outflow from Spillways	9,703	9,703	
Annual Loss from Pools from Evaporation	Minor		
Annual Loss from Pools by Seepage	55		
Net Annual Recoverable Recharge from the Ogallala	10		
Remaining in Aquifer or Returned to Streamflow	45		
Estimated Return as Spring Flow into Streams (Lower Red Deer Creek)	40	40	
TOTAL WITH PROJECT - POOLS FILLED WITH SEDIMENT ^{2/}		16,580	8,953

^{1/} Channel loss adjustment factor of 0.54 was obtained from SCS National Engineering Handbook, Hydrology, Section 4, Chapter 21, and is based on the expected losses from a 300-square mile drainage area with climatic index of 0.6.

^{2/} Structure No. 2 has a dry pool and the following sites will be filled with sediment in following period of years: Site 12, 17 years; Site 9, 41 years; Site 11, 52 years; Site 6, 56 years; Site 5, 65 years; Site 8, 67 years; Site 10, 72 years; Site 1, 84 years; Sites 3, 4, and 7, 100 years.

Comment: The assistant commissioner for the General Land Office stated that the environmental impact statement was exceptionally well prepared and that the implementation of the plan should prove very effective in the conservation and more efficient use of land resources with only a minimum of dedication of these resources for the construction process.

Response: Noted.

Comment: The Texas Industrial Commission stated that the project appears to be in the public interest and that the benefits to be derived outweigh the detrimental effects which have been forecast. As a result, the Commission had no negative comments to make on either the environmental impact statement or the work plan.

Response: Noted.

Comment: The Texas Highway Department stated that there would be no adverse effect on any section of highway and in some cases, it appears that the watershed control would possibly benefit the highway system.

Response: Noted.

Comment: The Texas Water Quality Board concluded that the proposed project would not pose lasting adverse environmental problems.

Response: Noted.

Comment: The Texas Air Control Board had no comments to offer.

Response: Noted.

Comment: The Texas State Soil and Water Conservation Board pointed out that they participated in the development of the work plan and worked with the local sponsors of the project from the time of receipt of application in May 1965. It is the Board's opinion that the project is needed and worthwhile, and is planned according to the desires of the local sponsors. They further state that the work plan and environmental impact statement accurately reflect planned and existing conditions in the watershed, and that they offer no adverse comments.

Response: Noted.

Panhandle Regional Planning Commission

Comment: The Board of Directors of the Panhandle Regional Planning Commission considered and unanimously endorsed the draft environmental statement.

Response: Noted.

LIST OF APPENDIXES

- Appendix A - Comparison of Benefits and Costs for Structural Measures
- Appendix B - Project Map
- Appendix C - Letters of Comment Received on the Draft Environmental Impact Statement
- Appendix D - Urban Area Map, Miami, Texas
- Appendix E - Urban Area Map, Canadian, Texas

APPROVED BY

Edward E. Thomas
State Conservationist

DATE

5-23-75

APPENDIX A - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES
 Red Deer Creek Watershed, Texas
 (Dollars)

Evaluation Unit	Average Annual Benefits ^{1/}				Average Annual		Benefit- Cost Ratio
	Damage Reduction	Incidental :Ground Water: Recharge	Secondary	Total	Annual Cost ^{2/}	Annual Cost	
20 Floodwater Retarding Structures	395,380	24,900	86,240	506,520	141,680	3.6:1.0	
Project Administration	xxx	xxx	xxx	xxx	21,130	xxx	xxx
GRAND TOTAL	^{3/} 395,380	24,900	86,240	506,520	162,810	3.1:1.0	

- ^{1/} Price Base: Current normalized prices for agricultural benefits and current (1974) prices for other benefits.
- ^{2/} Price Base: Installation, 1974 prices amortized for 100 years at 5-7/8 percent interest; operation and maintenance, current (1974) prices.
- ^{3/} In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of \$10,200 annually.

SITE NUMBERS AND DRAINAGE AREA IN ACRES

Site No.	Acres
1	13,530
2	23,238
3	6,790
4	3,112
5	1,786
6	2,989
7	608
8	1,613
9	4,384
10	1,946
11	1,888
12	21,587
13	2,368
14	3,226
15	7,667
16	5,869
17	3,693
18	2,784
19	9,728
20	5,658

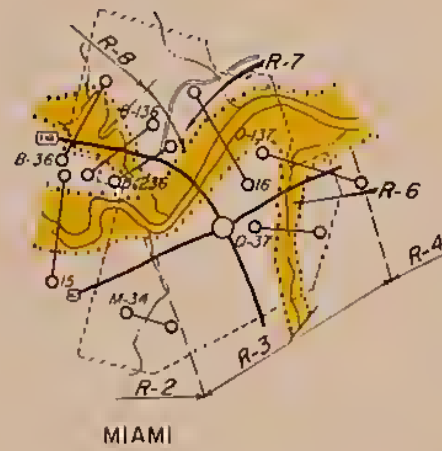
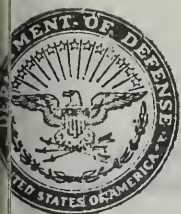


Figure 5
PROJECT MAP
RED DEER CREEK WATERSHED
GRAY, ROBERTS AND HEMPHILL COUNTIES
TEXAS
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEMPLE TEXAS

Map compiled at 63,160 and reproduced without change to meet for maximum impact on 1978

Letters of Comment Received
on the Draft Environmental Impact Statement





DEPARTMENT OF THE ARMY

WASHINGTON, D.C. 20310

16 JAN 1974

Honorable Robert W. Long
Assistant Secretary of Agriculture
Washington, D. C. 20250

Dear Mr. Long:

In compliance with the provisions of Section 5 of Public Law 566, 83rd Congress, the Administrator of the Soil Conservation Service, by letter dated 28 November 1973, requested comments on the Watershed Work Plan and Draft Environmental Statement for the Red Deer Creek Watershed, Gray, Roberts, and Hemphill Counties, Texas.

We have reviewed the work plan and foresee no conflict with any projects or current proposals of this office. The draft environmental statement is considered satisfactory.

Sincerely,

A handwritten signature in cursive script, reading "Charles R. Ford".

Charles R. Ford
Chief
Office of Civil Functions



DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

REGIONAL OFFICE

1114 COMMERCE STREET

DALLAS, TEXAS 75202

January 18, 1974

OFFICE OF
THE REGIONAL DIRECTOR

Our Reference: EI # 1273-300

Mr. Kenneth E. Grant
Administrator
U. S. Department of Agriculture
Soil Conservation Service
Washington, D.C. 20250
Dear Mr. Grant:

Re: Red Deer Creek Watershed Project,
Texas

Pursuant to your request, we have reviewed the Environmental Impact Statement for the above project proposal in accordance with Section 102(2)(C) of P. L. 91-190, and the Council on Environmental Quality Guidelines of April 23, 1971.

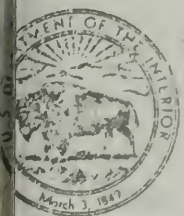
Environmental health program responsibilities and standards of the Department of Health, Education, and Welfare include those vested with the United States Public Health Service and the Facilities Engineering and Construction Agency. The U. S. Public Health Service has those programs of the Federal Food and Drug Administration, which include the National Institute of Occupational Safety and Health and the Bureau of Community Environmental Management (housing, injury control, recreational health and insect and rodent control).

Accordingly, our review of the Draft Environmental Statement for the project discerns no adverse health effects that might be of significance where our program responsibilities and standards pertain, provided that appropriate guides are followed in concert with State, County, and local environmental health laws and regulations.

We therefore have no objection to the authorization of this project insofar as our interests and responsibilities are concerned.

Very truly yours,

William F. Crawford
Environmental Impact Coordinator



United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

ER-73/1557

FEB 13 1974

Dear Mr. Grant:

Thank you for the letter of November 28, 1973, requesting our views and comments on the work plan and draft environmental statement for the Red Deer Creek Watershed, Gray, Roberts, and Hemphill Counties, Texas.

We have completed our review of the work plan and submit the following comments for your consideration and use.

The work plan reflects adequate consideration of the fish and wildlife resources. We are also pleased to note that the work plan contains specific language implementing the six recommendations made in the December 22, 1970, reconnaissance report of our Bureau of Sport Fisheries & Wildlife.

Page 10, third full paragraph, first sentence. The Bureau of Sport Fisheries & Wildlife has recently substituted the designation "threatened" for the previously used designations of "rare" or "endangered" in "Threatened Wildlife of the United States," Resource Publication 114, March 1973. The Department of the Interior maintains the official list of Endangered Species.

Page 23, first paragraph, last sentence. This indicates that evaporation losses may be high which does not agree with the seventh paragraph on page 3 in the work plan or the last paragraph on page 22 in the draft environmental statement. Clarification of the evaporation losses expected is needed.

We reviewed earlier drafts of the work plan and environmental statement and noted that the work plan recognized the existence of both oil and gas production and continuing exploration in the area. The review further noted a work plan statement that no proposed project structures would interfere with petroleum or other mineral production and



suggested that such a conclusion be emphasized in the final drafts. This has been done. The current documents recognize the existence of pipelines within two of the proposed reservoirs and state that they will be relocated. File data indicate that mineral deposits in Gray County yielded petroleum, natural gas, and natural gas liquids valued at \$40.2 million in 1971 and deposits in Hemphill and Roberts Counties yielded natural gas and petroleum valued at \$26.7 million and \$10.4 million, respectively.

No mention is made in either of the documents of the possibility of improperly plugged dry or abandoned oil or gas wells within the reservoir sites, nor is any explanation given for plans to alleviate any pollution problems that may arise from such wells. Although finding dry or abandoned wells often is extremely difficult, we suggest that an attempt be made to do so.

Both documents mention two important paleontological sites and one mineralogical site (work plan, page 11; environmental statement, page 8). Neither explains the significance of the sites in relation to the proposed works of improvement. We suggest that the final environmental statement include discussions of the points set out in this and the preceding paragraph.

Implementation of the proposed watershed work plan will not adversely affect any existing, proposed or known potential unit of the National Park System, or any known historic, natural or environmental education sites eligible for the National Landmark Programs.

It is stated that Structure No. 2 would be designed for a "dry sediment pool and there will be no planned impoundment of water in the reservoir" (EIS, page 17). This is also confirmed by Table 3 (work plan, page 57). However, Figure 5 shows a dark blue pattern that apparently represents a permanent pool behind Structure No. 2. Blue patterns on the map should be identified more fully in the legend and the plan for Structure No. 2 should be clarified.

A large volume of fill would be required for the 20 structures, the total being more than 4 million cubic yards of compacted fill. The only mention of the composition of

the fill appears to be the general statement that it would be obtained from spillway excavations, at least in part. However, these sites apparently have a very wide range in composition. It would be advisable to provide more information on the planned composition of the structures, including acceptable limits of material suitable for the fill.

In regard to sedimentation rates for suspended sediments contained in impounded runoff, it is stated that "the trap efficiency was estimated to be 90 percent for clayey sediments and 95 percent for sandy sediments" (work plan, page 66, item 1b). These figures are important because one of the main purposes of the structures is to reduce the deposition of sediment on flood plains, particularly sandy sediment which is said to be most damaging (EIS, page 2). Elsewhere it is stated that average annual sediment deposition on the flood plain would be reduced 64 percent, and that most of the reduction would be in coarser sediment (sand) while silt and clay would be less affected (EIS, page 21). Considering the extremely large difference between sedimentation rates of sand and clay, the 5 percent difference in trap efficiencies for sand and clay noted above seems too small. It would be helpful to explain the basis for selecting these values and to define the approximate grain sizes referred to in these calculations.

We have several reservations with regard to the discussions of incidental recharge benefits. First, there is no indication as to how the amount of recharge was determined. Second, on page 22 of the statement, it is stated that 1,330 acre-feet of recharge would be expected to be recovered by 30 irrigation farms. There should be some substantiation of this statement. In order for the irrigation wells to benefit from the recharge, the wells would necessarily have to be in the immediate vicinity of the recharge structures. Also, it would seem that any recharge effects of the structures would tend merely to sustain or produce springflow immediately downstream from the structures. The effects of recharge thus would be of a very local nature.

We have reviewed the draft environmental statement and submit the following comments for your consideration and use in preparing the final statement.

General Comments

The draft environmental statement presents too optimistic a view of the project's potential beneficial effects on fish and wildlife. These beneficial effects are dependent on landowners and operators applying secondary land-treatment measures which are designed primarily for the benefit of fish and wildlife. Without some binding certification indicating that these measures will in fact be completed, it is not logical to make the assumption that benefits to fish and wildlife will be realized.

The probable effects upon archeological resources, if they exist, are likely to be adverse, cumulative, and irreversible and should be discussed in the relevant sections of the environmental statement. Measures needed to mitigate the adverse effects of the project on archeological resources should be fully described in the appropriate section.

Environmental Setting

The discussion in the fourth paragraph, page 4, leaves the reader with the impression that all woody plants are considered as undesirable as they will crowd out the grass if left uncontrolled. Several of these woody plants are important to wildlife and their retention in the study area should be controlled but not eliminated. If eliminated from the study area, the absence of the plants would adversely impact on the diversity of habitat needed to sustain these wildlife species and bring about a resultant reduction in their numbers.

Page 7, third full paragraph. The Bureau of Sport Fisheries and Wildlife has recently substituted the designation "threatened" for the previously used designations of "rare" or "endangered" in "Threatened Wildlife of the United States," Resource Publication 114, March 1973. The Department of the Interior maintains the official list of Endangered Species. We suggest this paragraph be revised to reflect the above information. Also, the presence or absence of the swift fox should be clarified.

On page 8 we suggest that the section of the final statement dealing with cultural resources should contain a sentence indicating the National Register of Historic Places has been consulted and whether National Register properties will be affected by the plan.

Planned Project

Page 16, fourth paragraph. This paragraph should be expanded to include acreages which could be strip-plowed for production of weeds, fenced areas of plantings for wildlife food production, the types of plants that could be used for wildlife food production, what is involved in the supplemental feeding for quail, turkey, and deer that could take place, and the number of watering spots which would be constructed.

This paragraph should also be expanded to discuss the possibility of an accelerated eutrophication rate of ponds due to fertilization from feedlot, warmup pen, and crop runoff.

Environmental Impacts

Page 23, last paragraph, third sentence. This sentence states: "Increase in the density of grasses and forbs on treated rangeland will improve the quality of habitat for the lesser prairie chicken; however, it will not be advantageous to dove and quail" This appears to contradict the last paragraph on page 44 of the work plan which states, "The vegetative conditions which are expected to improve the habitat for the lesser prairie chicken in new areas of the watershed will have a detrimental effect as a habitat for doves and quail. These detrimental effects, however, will be offset by strip plowing of soils areas in grassland for forbs and other seed producing vegetation." Some clarification of the project's effects on dove and quail habitat and of the value of forbs to doves and quail is needed.

Page 24, first paragraph, third sentence. This sentence should be revised to include the possible adverse effects which a rising water table could have on the nearby prairie dog colonies.

Archeological, Historic and Scientific

The draft environmental statement does not deal substantively with the impact of the proposed actions on archeological resources and thus does not comply fully with the requirements of the Council on Environmental Quality's Guidelines for environmental statements.

In order to provide a basis for evaluating the effects of proposed actions, a survey of the affected area should be conducted by a competent, professional archeologist. The survey should provide the following kinds of information:

- a. The presence of archeological resources in areas to be affected by the proposed actions, including descriptions and maps, showing their relationship to the project.
- b. A description of survey methods and the intensity of the survey.
- c. The significance of the identified resources and their potential for contributing information about the archeological problems of the project area, including identification of those which may merit listing on the National Register of Historic Places.
- d. A cost estimate for the recovery of all data from significant archeological resources to be affected by the project.
- e. A recommended program of studies to realistically mitigate adverse effects which will result from the project, including research designs and estimates of time and funding needed.
- f. Recommendations for any other mitigation measures which may lessen the adverse effects on the project.

The archeological report and its author should be cited in the environmental statement, and his report may be summarized or included as an appendix.

The long and short term favorable impacts were covered, but the short range adverse impacts need more coverage.

Surface disturbance from application and installation of project measures may have a short-term adverse impact on soil, water and wildlife resources. Such impacts warrant analysis and identification in the statement.

Mitigation

We suggest that the final statement contain a section which is devoted to identifying and discussing the measures which will be employed to mitigate adverse effects. With such a discussion following the impact section, it will provide the reviewer with an easy transition into the section which discusses the adverse effects which cannot be avoided.

Adverse Impacts

This section should be expanded to discuss and, if possible, quantify the loss of dove, quail pheasant, and antelope habitat that will occur as a result of implementing these project features.

Alternatives

We believe this section could be expanded to reflect another real alternative to the recommended project. We believe the implementation of a proper livestock grazing management program with sound agricultural practices could be carried out without need of the other project measures. Success in improving vegetation density and composition has been achieved in other areas by initiating a good livestock management grazing program without brush conversion and seeding.

We trust the foregoing comments will assist you in the orderly processing of this report to the Congress.

Sincerely yours,

Acting
Deputy Assistant Secretary of the Interior

Will A. Vay

Mr. Kenneth E. Grant, Administrator
U. S. Department of Agriculture
Soil Conservation Service
Washington, D. C. 20250



DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS: (G-WS/73)
U.S. COAST GUARD
400 SEVENTH STREET SW.
WASHINGTON, D.C. 20590
PHONE: (202) 426-2262

17 Jan 1974

• Mr. Kenneth E. Grant
Administrator.
Soil Conservation Service
Department of Agriculture
Washington, D. C. 20250

Dear Mr. Grant:

This is in response to your letter of November 28, 1973 addressed to Admiral Bender concerning the draft environmental impact statement for the Red Deer Creek Watershed, Grey, Hemphill and Roberts Counties, Texas.

The Department of Transportation has reviewed the material submitted. We have no comments to offer nor do we have any objection to this project.

The opportunity to review this environmental impact statement is appreciated.

Sincerely,

R. J. FRISE
Captain, U.S. Coast Guard
Dept. of Transportation
Washington, D.C.

**ADVISORY COUNCIL
ON
HISTORIC PRESERVATION**

WASHINGTON, D.C. 20240

December 13, 1973

Mr. Kenneth E. Grant
Administrator
Soil Conservation Service
U.S. Department of Agriculture
Washington, D.C. 20250

Dear Mr. Grant:

This is in response to your request of December 10, 1973, for comments on the environmental statement for Red Deer Creek Watershed, Gray, Roberts, and Hemphill Counties, Texas. Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council on Historic Preservation has determined that your draft environmental statement appears procedurally adequate. However, we have the following substantive comments to make:

To insure a comprehensive review of historical, cultural, archeological, and architectural resources, the Advisory Council suggests that a copy of the State Historic Preservation Officer's comments concerning the effects of the undertaking upon these resources be included in the final environmental statement.

Sincerely yours,

Ann Smith

Ann Webster Smith
Director, Office of Compliance

ENVIRONMENTAL PROTECTION AGENCY

REGION VI

1600 PATTERSON, SUITE 1100
DALLAS, TEXAS 75201

January 21, 1974

OFFICE OF THE
REGIONAL ADMINISTRATOR

Mr. Kenneth E. Grant
Administrator
Soil Conservation Service
Washington, D.C. 20250

Dear Mr. Grant:

We have reviewed the Draft Environmental Impact Statement and the Watershed Work Plan for the Red Deer Creek Watershed, Gray, Robert, and Hemphill Counties, Texas. The proposed project includes land treatment measures on 39,010 acres of cropland and grassland, and 20 floodwater retarding structures to be constructed during a ten-year period.

The statement and the work plan adequately discuss most of the impacts from the proposed watershed project. The following comments are made to assist you in developing the Final Environmental Impact Statement:

1. We believe the summary sheet should more clearly define that more than half of the flood reduction benefits from this project will accrue to one private corporation, the Atchison, Topeka, and Santa Fe Railway Co. Since most of the flood damages in the watershed occur to this railroad, the alternative of relocating it, possibly with some type of government assistance, should be discussed. The inclusion of this alternative and a description of the environmental impacts would strengthen the statement.

2. The final statement should discuss the effect of the cancellation of the Agricultural Conservation Program on the application of the land treatment measures. In particular, will the cancellation of this program affect the planned fish and wildlife development?

3. What methods of brush control are planned for the 28,200 acres currently infested with mesquite and other undesirable vegetation? If chemical brush control methods are to be used, the chemicals to be used should be listed, along with the federal registration number and the intended use.

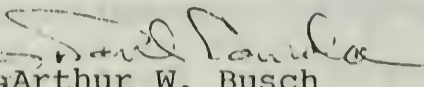
4. The benefits to irrigation farmers from incidental groundwater recharge are expected to be \$24,400 annually. Since this recharge will gradually diminish to almost zero over the life of the project, we would like to know if this figure represents benefits from recharge during the first year after project completion, or an average discounted value over the life of the project.

These comments classify your Draft Environmental Impact Statement as LO-2. Specifically, we have no objections to the proposed project. However, we are requesting more information on several aspects of this project, in order to fully evaluate its environmental impacts. The classification and date of our comments will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal actions, under Section 309 of the Clean Air Act.

Definitions of the categories are provided on the attachment. Our procedure is to categorize our comments on both the environmental consequences of the proposed action and on the adequacy of the impact statement at the draft stage, whenever possible.

We appreciate the opportunity to review the Draft Environmental Impact Statement. Please send us two copies of the Final Environmental Impact Statement at the same time it is sent to the Council on Environmental Quality.

Sincerely yours,


for Arthur W. Busch
Regional Administrator

Enclosure

ENVIRONMENTAL IMPACT OF THE ACTION

LO - Lack of Objections

EPA has no objections to the proposed action as described in the draft impact statement; or suggests only minor changes in the proposed action.

ER - Environmental Reservations

EPA has reservations concerning the environmental effects of certain aspects of the proposed action. EPA believes that further study of suggested alternatives or modifications is required and has asked the originating Federal agency to re-assess these aspects.

EU - Environmentally Unsatisfactory

EPA believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the potential safeguards which might be utilized may not adequately protect the environment from hazards arising from this action. The Agency recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

ADEQUACY OF THE IMPACT STATEMENT

Category 1 - Adequate

The draft impact statement adequately sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

Category 2 - Insufficient Information

EPA believes the draft impact statement does not contain sufficient information to assess fully the environmental impact of the proposed project or action. However, from the information submitted, the Agency is able to make a preliminary determination of the impact on the environment. EPA has requested that the originator provide the information that was not included in the draft statement.

Category 3 - Inadequate

EPA believes that the draft impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonably available alternatives. The Agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the impact statement. If a draft statement is assigned a Category 3, no rating will be made of the project or action, since a basis does not generally exist on which to make such a determination.



OFFICE OF THE GOVERNOR
DIVISION OF PLANNING COORDINATION

JAMES M. ROSE
DIRECTOR

March 5, 1974

Mr. Kenneth E. Grant
Administrator
United States Department of Agriculture
Soil Conservation Service
Washington, D. C. 20250

Dear Sir:

In accordance with Section 102(2)(c) of the National Environmental Policy Act of 1969, the Governor's Division of Planning Coordination and other interested State agencies have reviewed the "Draft Environmental Impact Statement and Work Plan for Red Deer Creek Watershed, Gray, Roberts, and Hemphill Counties, Texas."

While the reviewing agencies generally found that the Draft Environmental Impact Statement complied with the intent of the National Environmental Policy Act, the following specific recommendations should be given additional consideration:

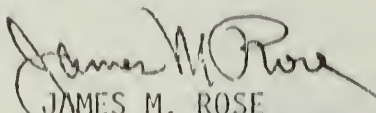
1. The Texas Water Development Board recommended coordination with the Canadian River Compact Commissioner, as Red Deer Creek is a tributary of this river.
2. Additional geologic engineering studies are recommended by the Bureau of Economic Geology, with specific reference given to sediments and the possibility of foundation instability.
3. The Texas Historical Commission indicated that a preliminary field reconnaissance, intensive archeological survey and scientific recovery program be initiated to mitigate the adverse effects of the proposed project.
4. The Texas Water Rights Commission noted that the extensive time-frame for the construction of this project could be an adverse aspect, due to rising costs and other economic factors;

it was further noted that the questions of aquifer recharge and the possibility of an increase in undesirable vegetation should be given additional study.

Enclosed are specific comments from all of the agencies which were involved in this review. These comments should be considered in their entirety.

If we can be of further assistance, please let us know.

Sincerely,


JAMES M. ROSE
Director

JMR/wsb

Enclosures

cc: Mr. A. E. Richardson, Texas Water Rights Commission
Mr. Harry P. Burleigh, Texas Water Development Board
Dr. W. L. Fisher, Bureau of Economic Geology
Mr. Truett Latimer, Texas Historical Commission
Hon. John C. White, Texas Department of Agriculture
Mr. James H. Harwell, Texas Industrial Commission
Mr. B. L. DeBerry, Texas Highway Department
Mr. Hugh C. Yantis, Jr., Texas Water Quality Board
Mr. Charles R. Barden, Texas Air Control Board
Mr. Harvey Davis, Texas State Soil and Water Conservation Board

TEXAS WATER DEVELOPMENT BOARD

517

HARRY P. BURLEIGH
EXECUTIVE DIRECTOR



P.O. BOX 11087
CAPITOL STATION
AUSTIN TEXAS 78711

January 23, 1974

AREA CODE 512
495-2201

301 WEST 2ND STREET

IN REPLY REFER TO

TWDBP-O

MEMBERS
H. MCCOY CHAIRMAN
W. BOSTON
N. CHURBET VICE CHAIRMAN
P. GILMORE
J. LINSLEY
J. POTT
J. RINGSTON
J. TILG
J. WILSON

General James M. Rose, Director
Division of Planning Coordination
Office of the Governor
P.O. Box 12428, Capitol Station
Austin, Texas 78711

Dear General Rose:

Please refer to your memorandum dated January 8, 1974 transmitting for review and comments the Soil Conservation Service's "Draft Environmental Statement and Work Plan for Red Deer Creek Watershed, Gray, Roberts, and Hemphill Counties, Texas."

Our staff-level review of the above named reports finds that water resource development projects included in the Texas Water Plan will not be affected by the proposed watershed work plan. It is our opinion that the Parks and Wildlife Department, the State Soil and Water Conservation Board, and the State Historical Survey Committee are agencies having primary responsibilities in review of the Red Deer Creek plan of development.

Red Deer Creek is a tributary of the Canadian River which has been compacted by the states of New Mexico, Oklahoma, and Texas. Any plan of development within the entire Canadian River Basin should be done in compliance with terms of the Compact. We therefore suggest that sponsors of the Red Deer Creek project discuss their plan of development with Mr. Leon Hill, Canadian River Compact Commissioner, Texas.

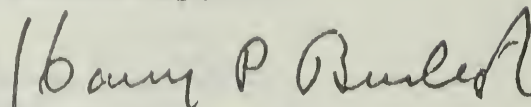
Our staff members who have conducted the review of the proposed plan of development of Red Deer Creek find that the Environmental

General James M. Rose, Director
January 23, 1974
Page 2

Impact Study is adequate, and that it complies with the intent of PL 91-190, Section 102(c).

We appreciate the opportunity to offer these comments.

Sincerely,

A handwritten signature in dark ink, appearing to read "Harry P. Burleigh". The signature is written in a cursive style with a large, stylized initial "H".

Harry P. Burleigh



THE UNIVERSITY OF TEXAS AT AUSTIN

BUREAU OF ECONOMIC GEOLOGY

AUSTIN, TEXAS 78712

January 23, 1974

University Station, Box X
Phone 512-471-1534

General James M. Rose, Director
Division of Planning Coordination
Post Office Box 12428, Capitol Station
Austin, Texas 78711

Dear General Rose:

The staff of the Bureau of Economic Geology has received the Draft Environmental Statement for Red Deer Creek Watershed, Gray, Roberts and Hemphill Counties. We offer the following comments:

A delicate balance exists between stream discharge and sediment load, so that if sediment is retained at one point in the system (i.e. in headwater areas) then the stream will erode more vigorously downstream to reestablish an equilibrium. This process will effectively negate the proposed benefit (p. 26) of "reducing streambank erosion." For the same reason, a decrease in sediment load from Red Deer Creek to Canadian River is not likely, at least not without a proportional decrease in water discharge.

Each catchment dam site must be considered regarding detailed engineering properties of substrate. This is not adequately presented under "Geologic Investigations" (p. 67-68). The Environmental Impact Statement notes that material constituting the near-surface beds of the Ogallala Formation is "clayey" and falls within the "CL" category of the unified soil classification. However, according to our information, there are significant local occurrences in the Ogallala of montmorillonite (a clay with high "shrink-swell" properties). These clays, if encountered, pose threats to foundation stability. The specific nature of all "clayey" deposits should be presented in terms of Atterberg limits and other soil-engineering parameters.

Thank you for the opportunity to review this statement.

Sincerely,

A handwritten signature in dark ink, appearing to read "W. L. Fisher".

W. L. Fisher
Director

WLF:ph



Texas State Historical Survey Committee

Box 12276, Capitol Station, Austin, Texas 78711

Truett Latimer

Executive Director

January 16, 1974

Mr. James M. Rose, Director
Office of the Governor
Division of Planning Coordination
P. O. Box 12428, Capitol Station
Austin, Texas 78711

RE: Draft Environmental Statement and Work Plan for Red Deer
Creek Watershed, Gray, Roberts and Hemphill Counties, Texas.

Dear Mr. Rose:

In response to your request concerning the above-referenced project, we have examined the documents and our records and offer the following comments:

1. The information provided on page 8, Archeological and Historic Values and Unique Scenic Areas is based on a records check and none of the area to be committed to the twenty (20) floodwater retarding structures has been examined for the presence of cultural (prehistoric, historic and architectural) resources by a competent archeologist.
2. While the Texas Historical Commission agrees that a records check of known resources is the first step in defining the impact of a project on cultural resources, it does not provide substantive data necessary to assess project impact on the resource.
3. Substantive data or factual information acquired by systematic examination of a project area by a professionally qualified observer is necessary in order to prepare a detailed and accurate statement of impact which complies with the NEPA of As an accurate and detailed assessment of impact cannot be obtained from general textbooks or generalized treatments of the region in which an action is located, cultural resources affected by a Federal action must be identified by such a systematic examination of the project area. The area of any project requiring an environmental impact statement should be subjected to a *preliminary field reconnaissance* to define the general categories of cultural and related environmental resources contained within the area, leading to an estimate of the time and cost of an adequate intensive survey. The preliminary field reconnaissance should be completed during draft EIS

formulation and the draft should include the results of the reconnaissance as well as cost and time analysis required for further study.

4. The next step necessary to mitigate the loss of cultural resources is the *intensive archeological survey*. An intensive archeological survey of the total project area must be conducted to locate, record, identify, and appraise the significance of the resource to be affected. This examination should provide, and result in, definition of research problems, cost and strategy for further study leading to the mitigation of adverse effects on the resource.
5. *Scientific recovery* of information contained in cultural resources can mitigate the adverse affect of an action on the resource. An acceptable mitigation program should recover a reliable sample of all significant cultural and related ecological resources which will be affected through the use of a systematically prepared and explicitly stated research design under the direction of a competent professional archeologist. Measures other than recovery of the resource may be considered and may include protection of the resource through management measures, stabilization or no project action; all must be assessed from the perspective of preserving resources for future generations.

As the steps necessary to gather the substantive data required to assess project impact on the resource (other than the data which have been provided to the Soil Conservation Service by the Texas Historical Commission concerning previously known cultural resources) have not been performed, the impact of the project on the resource cannot be evaluated. Therefore, those sections dealing with cultural resources are inadequate.

Thank you for the opportunity to examine and comment on this Draft Environmental Statement and Work Plan. If we may be of further assistance, please advise.

Sincerely,

Truett Latimer
Executive Director

By



Alton K. Briggs
Archeologist

AKB:pc

TEXAS WATER RIGHTS COMMISSION

SAM HOUSTON STATE OFFICE BUILDING

COMMISSIONERS

D. CARTER, CHAIRMAN
5-2453

A. F. DENT
5-2451

GEY B. HARDEMAN
5-4325

January 23, 1974

A. E. RICHARDSON
EXECUTIVE DIRECTOR
475-2452

AUDREY STRANDTMAN
SECRETARY
475-4514

Mr. James M. Rose, Director
Governor's Division of Planning
Coordination
P. O. Box 12428, Capitol Station
Austin, Texas 78711

Re: U.S. Department of Agriculture, Soil
Conservation Service's Documents:
A. Watershed Work Plan (May 1973);
B. Draft Environmental Statement
(October 1973;
on Red Deer Creek Watershed,
Gray, Roberts, and Hemphill Counties,
Texas.

Dear Mr. Rose:

In reply to your request by Memorandum of January 8, 1974, and also, in reply to the request of the Administrator, U.S. Department of Agriculture, Soil Conservation Service, by Letter of November 29, 1973, the staff of the Texas Water Rights Commission has reviewed the subject documents pertaining to the 10-year, estimated \$3,465,620 Red Deer Creek Watershed Development Project. Attached for your information and use is our staff Memorandum of Review. This review was made pursuant to the Commission's responsibilities as a member agency of the Interagency Council on Natural Resources and the Environment (ICNRE) -- assisting your office in making the Clearinghouse Review required by Office of Management and the Budget (OMB) Circular A-95.

Attention is invited to the fact that member agencies of the Interagency Council on Natural Resources and the Environment commented on the Preliminary Draft documents of the referenced project during March 1973, and that the Governor's Division of Planning Coordination transmitted these comments to the State Conservationist, Soil Conservation Service, Temple, Texas, by Letter of March 26, 1973.

Mr. James M. Rose

January 23, 1974

Page 2

The attached detailed staff review comments are submitted with constructive intent, with the view of assisting all planners concerned in developing a viable program warranting early approval, funding, and completion.

If you have any questions on the foregoing comments, please contact Dr. Alfred J. D'Arezzo, Environmental Sciences Analyst, telephone number 512-475-2678, who has been designated as the Commission's staff review coordinator on this case.

Sincerely yours,

A handwritten signature in cursive script that reads "A. E. Richardson".

A. E. Richardson

AER-AJD:11

Attachment
As stated.

To: Executive Director
Texas Water Rights Commission

January 21, 1974

MEMORANDUM OF REVIEW
OF
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
DOCUMENTS:

- A. WATERSHED WORK PLAN (WP), (MAY 1973)
B. DRAFT ENVIRONMENTAL STATEMENT (DES), (OCTOBER 1973)

ON
RED DEER CREEK WATERSHED
GRAY, ROBERTS, AND HEMPHILL COUNTIES, TEXAS

By: Dr. Alfred J. D'Arezzo,
Environmental Sciences Analyst

1. INTRODUCTION

1.1 Basis for Review.

- a. By Letter of November 29, 1973, the Administrator, U.S. Department of Agriculture, Soil Conservation Service, Washington, D.C., transmitted to the Director, Division of Planning Coordination, Office of the Governor, the two subject documents pertaining to the Red Deer Creek Watershed Project, Texas -- requesting review comments by January 21, 1974.
- b. By Memorandum of January 8, 1974, the Director, Governor's Division of Planning Coordination (DPC), transmitted the subject documents to the member agencies of the Interagency Council on Natural Resources and the Environment (ICNRE) for review and comment by January 24, 1974.
- c. This review by the Texas Water Rights Commission (TWRC) staff is made in accordance with the

Commission's responsibilities as a member agency of the ICNRE -- to assist the Governor's DPC in that Division's capacity as the State of Texas' Clearinghouse for the review of Federal programs, governed by the provisions of Revised Office of Management and the Budget (OMB) Circular A-95, dated February 9, 1971. The comments in this review should not be misconstrued as the formal views or position of the Commissioners of the Texas Water Rights Commission on the details of the final project plans, or on the actual or potential water rights impacts arising from the overall plan or subprojects thereof which might come before the Commission for adjudication.

1.2 Previous Actions.

- a. On March 12, 1973, the TWRC submitted to the Governor's DPC review comments on the Preliminary Draft Environmental Impact Statement (January 1973) on the subject watershed project.
- b. By letter of March 26, 1973, the Acting Director, Governor's DPC informed the State Conservationist, Soil Conservation Service, Temple, Texas, of the major review comments by member agencies of the ICNRE. The detailed comments of the TWRC staff were not transmitted by the Governor's Office.
- c. By letter of May 2, 1973, the Environmental Sciences Analyst, Texas Water Rights Commission, in response to a telephone request from Mr. W. W. Snyder on May 1, 1973, transmitted to Mr. Snyder, Soil Conservation Service, Temple, Texas, copies of the Commission staff's formal review memoranda for both the Red Deer Creek and Kickapoo Creek Watershed Projects. Acknowledgement of the receipt of these mamoranda was made by the State Conservationist in letter of May 10, 1973, to the Executive Director, Texas Water Rights Commission.

1.3 Essential Considerations Limiting the Scope of Review.

- a. The availability of detailed review comments on the subject documents by the major Federal and other governmental agencies concerned is considered essential for a realistic review by State agencies. The subject documents indicate that the WP was developed in full consultation, in cooperation with, appropriate Federal, State, and local agencies, and that information and comments were solicited from these agencies. These individual, detailed agency comments are considered an integral part of the review process, and their availability would facilitate the OMB Circular A-95 clearinghouse review. (See DES, pages 30-31).
- b. A review of the subject documents now under review do not highlight, for purposes of quick inspection, what changes, if any, were made on the documents as a result of previous review comments by interested agencies. The limited time allotted for review precludes thorough screening of the changes made.

2. ESSENTIAL BACKGROUND

2.1 Statutory Basis.

- a. The Watershed Protection and Flood Prevention Act of 1954 (Public Law 83-566, 68 Stat. 666, as amended, 16 U.S.C.A., 1001, et seq.), declares it to be the sense of Congress that the Federal Government should undertake a cooperative program for the purpose of preventing "'(e)rosion, floodwater and sediment damages in the watersheds of the rivers and streams of the United States, causing loss of life and damage of property,' and for the purpose of 'furthering the conservation, development, utilization and disposal of water, and the conservation and utilization of land.'" (16 U.S.C.A. 1001.) The land use

elements of this program were added by Section 201 of the Rural Development Act of 1972, Public Law 92-419, 86 Stat. 657, 667.

- b. The works of improvement, under Public Law 83-566, are structural and land treatment measures for flood prevention are measures for the conservation development, utilization, and disposal of water or for the conservation and proper utilization of land. The works of improvement must be carried out in watersheds or subwatersheds of 250,000 acres or less. No single structure can provide more than a total of 25,000 acre-feet of total capacity, nor more than 12,500 acre-feet of floodwater detention capacity. (7 U.S.C.A. 1002.)
- c. When the Secretary of Agriculture and the local organization have agreed on a watershed work plan, it is reviewed for 60 days by the State Governor and concerned Federal agencies. (7 CFR 600.3(c) (1972).)
- d. Any plan involving an estimated Federal contribution to construction costs in excess of \$250,000 or including any structure having a total capacity in excess of 2,500 acre-feet must be transmitted (a) to the Secretary of the Interior if the plan includes reclamation or irrigation works or affects public or other lands or wildlife under the jurisdiction of the Secretary of the Interior, (b) to the Secretary of the Army if it includes Federal assistance for flood water detention structures, (c) to the Secretary of Health, Education, and Welfare if the plan includes features, which may affect the public health, and (d) to the Administrator of the Environmental Protection Agency if the plan includes measures for the control or abatement of water pollution. The views and recommendations of Army and Interior, HEW and EPA must accompany the plan transmitted to Congress if they are received prior to the expiration of the 30-day period. (16 U.S.C.A. 1005(4).) In practice the comment period is 60 days, as indicated above.

- e. In addition, for plans which include any structure with a total capacity of more than 2,500 acre-feet, or for plans involving an estimated Federal contribution in excess of \$250,000, approval by resolution of the appropriate Senate and House committees is required. (16 U.S.C.A. 1002.)

2.2 Basic Project Data.

- a. General Scope: A 10-year, comprehensive watershed development program, involving (1) the construction of 20 floodwater-retarding dams and reservoirs, draining areas ranging from 608 acres (Site No. 7) to 23,238 acres (Site No. 2); and (2) implementation of agricultural land and related natural resources use, conservation, and treatment measures on 39,010 acres of cropland and grassland (DES, Summary Sheet).
- b. Project Area Watershed: 211,480 acres.
- c. Soils: The Southern High Plains Land Resources Area (High Plains) comprises 30 percent of the watershed. The Central Rolling Red Plains Land Resources Area (Rolling Red Plains) comprises 70 percent of the watershed. Most of the cropland, i.e., 21.6 percent of the watershed is in the High Plains portion of the watershed. Most of the rangeland, i.e., 71.8 percent of the watershed is in the Rolling Red Plains portions of the watershed (DES, pages 2 and 4).
- d. Flood Plain Hazard Situation: About 8,090 acres of flood plain area are subject to recurrent floodwater and floodwater sediment damages. About 6,720 acres of flood plain area are seriously damaged by stream aggradation causing fan-out of the flood plain. Large floods recur every four years; numerous small, cumulatively-destructive floods occur annually. The annual sediment load deposited is estimated at 450,000 tons (DES, page 2, 10).

e. Labor Force in the Watershed: The watershed contains 14,015 persons, representing 46 percent of the three-county labor force. About 13,000 persons, or ninetypercent, are employed in the agricultural sector. The remainder of the population, or 91 percent, are employed in the nonagricultural sector of the local economy (DES, page 6). The agricultural sector consists of 177 farm and ranch operating units, averaging 1,130 acres per unit, and 88 family-type and part-time operations, 26 of which suffer heavy damage during floods (DES, pages 6, 8). Large operating units and oil production have helped stabilize the agricultural economy. Future economic development and social stability will depend more and more on a stable agricultural sector as oil and gas production declines. Between the years 1960 through 1970, the population of the Cities of Pampa, Miami, and Canadian decreased by 10.6 percent (DES, page 15).

f. Status of Soil, Water, and Plant Development: About 7,630 acres, or 17 percent, of the total cropland of the watershed has received suitable land treatment (DES, page 8). It is estimated that about 60 percent of the total needed land treatment in the watershed already has been applied -- involving a cost of \$1,303,150 (DES, page 8; WP, page 55). In addition, soil and water conservation plans already have been developed for 146 of the 177 farm and ranch operating units in the watershed -- representing about 88 percent of the agricultural land in the watershed.

g. Project Costs.

(1) Structural	\$2,696,530
(2) Land Treatment	<u>769,090</u>
Total	\$3,465,620
(DES, page 20; WP, page 54)	

(3) Benefit-Cost Ratio: 1.9 to 1.0

However, the Benefit-Cost Ratio is 1.7 to 1.0, based on the discount rate of 6-7/8% which became effective on October 25, 1973, in accordance with the Water Resources Council's Principles and Standards (DES, page 32; WP, page 62).

The proposed system of 20 floodwater retarding structures will control the runoff from about 65 percent of the entire watershed area. The total floodwater retarding capacity of the structures is 30,349 acre-feet. The total capacity allocated for the expected 100-year accumulation of sediment is 10,432 acre-feet. The spillways for Structures Nos. 1, 4, 5, 6, and 8 through 20, will be ported at the elevation which will limit impoundments to 200 acre-feet, including borrow. Structure No. 2 will be designed for a dry sediment pool (DES, page 17). All the structures will have provisions to release impounded floodwater in order to perform maintenance, and, if necessary, to avoid jeopardy to prior downstream water rights (DES, page 17, 18).

ANALYSIS

3.1 Predominant Benefits and Costs of Project.

The staff believes that extension of the construction program for the 20-reservoir program over a 10-year period does not appear to be commensurate with the urgency and importance given in the project to the accomplishment of damage reduction to railroad, highway, and highway bridge facilities. The following cost analysis is significant.

- a. The total costs of the structures, i.e., \$2,696,530 is 77.7 percent of the total project costs, i.e., \$3,465,620 (WP, pages 54, 56).
- b. The total annual benefits due to the structures, i.e., \$290,420 (WP, page 62) is 98.5 percent of the total annual benefits of the entire watershed project, i.e., \$295,930 (WP, page 62).

- c. The total annual benefits due to "damage reduction," resulting from both the structures and land treatment, i.e., \$206,530 (WP, pages 61, 62), comprise 70 percent of the total annual benefits resulting from the structures and land treatment, i.e., \$295,930 (WP, page 62).
- d. The annual benefits due to "damage reduction," resulting from structures only, i.e., \$201,020 (WP, page 62), constitute 69.2 percent of the total annual benefits resulting from structures only, i.e., \$290,420 (WP, page 62).
- e. The annual benefits due to "damage reduction," resulting from structures only, i.e., \$201,020 (WP, page 62), is 97.3 percent of the total annual benefits due to "damage reduction," resulting from both structures and land treatment, i.e., \$206,530 (WP, page 61).
- f. The annual benefits due to "damage reduction" in railroad, highway, and highway bridge facilities, disregarding related "indirect damages," i.e., \$117,650 (WP, page 61), amount to 58.5 percent, at least, of the total annual benefits due to "damage reduction," resulting from structures only, i.e., \$201,020 (WP, pages 61, 62, and 71).
- g. The annual benefits due to "damage reduction" in railroad, highway, and highway bridge facilities, disregarding related "indirect damages," i.e., \$117,650 (WP, pages 61, 71), constitute 39.8 percent, at least, of the total annual benefits resulting from both the structures and land treatment, i.e., \$295,930 (WP, page 62).
- h. The annual benefits due to "damage reduction" to railroad, highway, and highway bridge facilities, i.e., \$117,650 (WP, page 61), constitute 40.5 percent of the total annual benefits resulting from structures only, i.e., \$290,420 (WP, page 62).

- i. The average annual cost of the structures is \$133,050 (WP, pages 60, 62).
- j. The total project annual cost is \$152,860 (WP, pages 60, 62).
- k. The annual cost of structures, i.e., \$133,050, is 87.5 percent of the total project annual cost, i.e., \$152,860.

Analysis of the foregoing percentages indicate that the thrust of the project, the predominant cost, and the major benefits are oriented to the protection of the railroad and highway facilities in the watershed area. In view of the apparent, continued need for the protection of these facilities against floods from as early as 1921 (WP, page 70), it is difficult to rationalize the justification for the slow phasing of the needed flood protection dams over another 10-year period. While it is recognized that the acquisition of land rights for the structures appear to be scheduled for completion over a two-year period (WP, pages 50, 51). The staff believes that the construction of the structures themselves appears to be unduly prolonged if it is stretched out over a 10-year period. Based on past flood damage statistics, it appears that substantial losses would be sustained over a 10-year period. Therefore, if the project is vital, both from National and State viewpoints, the structures portion of the Work Plan should be greatly expedited. Aside from the urgency of protection, there is also the realistic considerations of expected, continued rise in construction costs and other competitive demands for Federal funds.

3.2 Recharge of Ground Water Aquifers.

The staff believes that the documents under review would be enhanced if further explanation were given regarding the basis for determination of the incidental ground water recharge benefits, estimated at an average annual amount of \$24,400, resulting from the project (WP, pages 3, 62). Specifically, the report states:

"The project will provide incidental recharge to the ground water aquifer, which can be used by farmers for irrigation and will help maintain spring flow in Red Deer Creek." (WP, page 3.)

The description of the ground water investigations, contained on pages 68, and 69 of the Work Plan, indicates that the investigations were extensive. Hence, the staff believes that the following two questions raised by this analysis should be answered:

- a. Based on results of tests using playa lakes in the High Plains for ground water recharge purposes, will not the build-up of alluvium deposits in the floodwater-retarding basins virtually seal the beds of the basins, or cause a critical reduction in the porosity of the underlying aquifers within a few years? (Reference: Texas Tech University, Water Resources Center Report, WRC 71-6, ICASALS Special Report No. 49, "Conjunctive Use of Water in West Texas," September 1971, pages 15, 16, 17.)
- b. Will the numerous floodwater impoundments; the incidental aquifer recharge; and, the increased irrigation along the floodwater-routing system, possibly result in undesirable increased infestations of mesquite, sand sagebrush, yucca, willow, saltcedar, and baccharis plants? (See DES, page 9, concerning the present phreatophytic infestation of 28,200 acres within the watershed.)

3.3 Increase in Irrigated Cropland Acreages.

The staff believes that special clarification is necessary regarding the effects of adding increased acreages to the present inventory of irrigated croplands, and of also the effects of increased grazing on new rangelands in the geologically-unstable areas of the watershed.

If the Work Plan objectives and benefits are premised on a sizeable expansion in the agricultural sector, and on the attendant increase in the agricultural labor force now consisting of nine percent of the three-county population in the Red Deer Creek Watershed, consideration should be given to the possibility of accelerated land erosion effects and loss of water which may be triggered by the proposed project.

3.4 Anticipated Hydrological and Sedimentation Changes Resulting from the Watershed Program.

The staff believes that further explanation should be furnished on the rationale leading to the following predictions and estimates appearing on pages 22 and 23 of the DES:

"Immediately after their completion, evaporation and seepage losses in the sediment pools of the floodwater retarding structures will cause a minor reduction in the average annual volume of streamflow in Red Deer Creek and the Canadian River. It is estimated that initially streamflow at the U.S. Geological Survey gage on the Canadian River near Canadian, Texas, will be reduced by about three-tenths of 1 percent, based on an analysis of the gaged records for the period 1939 through 1969. As sediment accumulates in the sediment pools, the streamflow will again approach pre-PL 566 project conditions."

In this regard, special attention is invited to the findings contained in the study by Reid and Reuter ^{1/}, including review of work by others, concerning the

^{1/} George W. Reid and LeRoy H. Reuter, "A Technique for Evaluating the Effects of the Upstream Watershed Program on Downstream Runoff," The Bureau of Water Resources Research, The University of Oklahoma, Norman, Oklahoma, 1968.

effects of the Soil Conservation Service's (SCS) flood water retarding structure program in general, and, in particular, the Upper Washita River Watershed above the U.S.G.S. gage at Cheyenne, Oklahoma. The flood retarding structure program in the Upper Washita Basin is one of the most highly developed, and one of the first watersheds affected by the SCS program. The Upper Washita River Watershed in Texas is within the Rolling Red Plains Region. Its immediacy to the Red Deer Creek Watershed makes the experiences encountered in the Upper Washita quite relevant to the Red Deer Creek Watershed Plan. Hence, the following findings of the study by Reid and Reuter are worthy of consideration:

- a. With respect to the effects of land and watershed treatments on streamflow, the study found that:

"Estimates, by agricultural experts, as to the effect each of the land treatments had on runoff varied widely, generally from five to fifty percent, . . ." 1/

- b. Citing Kennon's study, which focused on the flood retarding structure program, it was found that:

". . .the flood structures effect becomes increasingly significant in drier years and that precipitation amount alone is not an adequate hydrologic variable for determining runoff."

"Kennon concluded that almost all seepage reappeared as surface flow below the structures. The amount of seepage was about

1/ Id., page 18.

the same as the net evaporation losses for the above normal precipitation years studied."1/

- c. In addition, Reid and Reuter mentioned results of Bliss' evaluation of data from the same watershed for the 1953-1956 water years, finding that:

"...about 75 percent of the inflow to the reservoir was lost. About half of the losses could be accounted for by evaporation, but no measurable seepage was reported as reappearing as stream-flow below the structures. The general drought conditions experienced during the period of Bliss' study and the fact that the structures were newer, and therefore subject to initial insoak, are possible causes for the disparity between the findings of Bliss and Kennon." 2/

- d. Regarding the studies of the Red River Basin, as contained in SCS's publication, "Effect of Agricultural Program on Annual Water Yield Red River Basin Above U.S. Geological Stream Gage near Index, Arkansas," Fort Worth, Texas: U.S. Department of Agriculture, 1961; Reid and Reuter indicate that:

"The effect of flood retarding structures on the Upper Washita above Cheyenne was computed to be more than twice that of farm ponds and land treatments. The study concluded that, in general, land treatment measures had smaller percentage of depletion effects on larger watersheds." 3/

1/ Id., page 21.

2/ Id., pages 20, 21.

3/ Id., pages 22, 23, and 171.

e. Regarding sedimentation, Reid and Reuter report that:

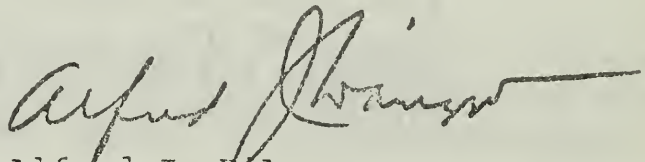
"Sediment studies in the Upper Washita River Basin indicate that the sediment pools are filling at a slower rate than that for which they were designed, but sediment data are not available for each structure. Several years of below normal precipitation could account for the reduced sediment loads." 1/

3.5 Environmental Enhancement.

The staff believes that the subject DES is in reasonable conformance with the provisions of Section 102(2) (C) of the National Environmental Policy Act of 1969. The list of favorable environmental effects, contained on pages 26 and 27 of the DES, show that the primary benefits are extensive, and that each of the 20 favorable effects listed involve obvious secondary benefits which might be equal or even greater than the monetary amounts of the primary benefits.

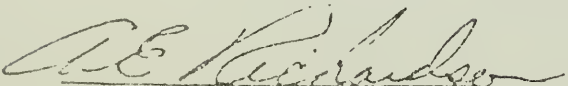
The only major adverse aspect of the project is the possible 10-year stretch-out in the construction of the floodwater retarding structures. The prolongation of the construction project over such a long period of time makes it increasingly vulnerable to the delays resulting from rising construction costs, material shortages, rising land costs, and changing national policies regarding justification of water resources projects.

AJD:11


Alfred J. D'Arezzo

NOTED:

A. E. Richardson
Executive Director



1/ Id., page 48.



EDMUND L. NICHOLS
Assistant Commissioner

January 24, 1974

General James M. Rose
Office of the Governor
Division of Planning Coordination
P.O. Box 12428

Dear General Rose:

The Draft Environmental Statement and Work Plan for Red Deer Creek Watershed, Gray, Roberts, and Hemphill Counties, Texas, enclosed with your memorandum of January 8, 1974, has been reviewed.

We believe this statement to be exceptionally well-prepared. The implementation of the plan should prove very effective in the conservation and more efficient use of land resources with only a minimum of dedication of these resources for the construction process.

Thank you for the opportunity to review this statement.

Sincerely,

A handwritten signature in dark ink, appearing to read "Edmund L. Nichols", written over a circular stamp or seal.

Edmund L. Nichols

ELN/yv

INDUSTRIAL COMMISSION

814 SAN HOUSTON STATE OFFICE BUILDING ☐ 512/475-4731 ☐ BOX 12728 CAPITOL STATION ☐ AUSTIN, TEXAS 78711

January 23, 1974

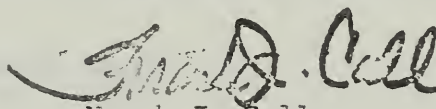
Mr. James M. Rose
Director
Division of Planning Coordination
Office of the Governor
P. O. Box 12428, Capitol Station
Austin, Texas 78711

Dear Mr. Rose:

I have reviewed the Draft Environmental Statement and Work Plan for Red Deer Creek Watershed, Gray, Roberts, and Hemphill Counties, Texas, for the Texas Industrial Commission. It appears that the proposed project is in the public interest and the benefits to be derived outweigh the detrimental effects forecasted. As a result, the Texas Industrial Commission has no negative comments to make on either the Environmental Statement or the proposed work plan.

If we may be of further service in this matter, please do not hesitate to contact me.

Sincerely,



Frank J. Call
Director of Research &
Planning

FJC:co

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Ann Arbor, Mich.
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COMMISSION

REAGAN HOUSTON, CHAIRMAN
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CHARLES E. SIMONS

TEXAS HIGHWAY DEPARTMENT
11TH AND BRAZOS
AUSTIN, TEXAS 78701

STATE HIGHWAY ENGINEER
B. L. DEBERRY

January 23, 1974

IN REPLY REFER TO
FILE NO. D8-P 454

Draft Environmental Statement and Work Plan
U.S. Department of Agriculture
Gray, Roberts and Hemphill Counties

Red Deer Creek Watershed

Mr. James M. Rose, Director
Division of Planning Coordination
Office of the Governor
P.O. Box 12428 Capitol Station
Austin, Texas 78711

Dear Mr. Rose:

Reference is made to your letter dated January 8, 1974, requesting comments regarding the above captioned draft environmental statement and work plan.

There will be no adverse effect on any section of highway, and in some cases, it appears that the watershed control would possibly benefit the highway system.

Sincerely yours

B. L. DeBerry
State Highway Engineer

By:

R. L. Lewis
R. L. Lewis, Chief Engineer
of Highway Design

cc: Federal Highway Administration

DUCLASS TOOLE
CHAIRMAN

ANK LEWIS
VICE-CHAIRMAN

RY P. BURLEIGH

YTON T. GARRISON

TEXAS WATER QUALITY BOARD



314 WEST 11TH STREET 78701
P.O. BOX 13246 CAPITOL STATION 78711
AUSTIN, TEXAS

JIM C. LANGDON

J. E. PFAVY, MD

HUGH C. YANTIS, JR.
EXECUTIVE DIRECTOR

PH. 475-2651
A.C. 512

January 15, 1974

Re: Draft Environmental Statement,
Red Deer Creek Watershed in
Gray, Roberts and Hemphill Counties

Mr. James M. Rose, Director
Division of Planning Coordination
Office of the Governor
Box 12428, Capitol Station
Austin, Texas 78711

Dear Mr. Rose:

The staff of the Texas Water Quality Board has completed a review of the draft environmental statement for Red Deer Creek Watershed Work Plan and have concluded that the projects proposed would not pose lasting adverse environmental problems. It has been noted that the area will be protected from soil erosion and water and air pollution both during and after construction. Also that assurances have been given that adequate sanitary facilities meeting state health standards will be provided at reservoirs prior to any recreational use.

We appreciate the opportunity to review this draft environmental statement. If we can be of further assistance, please let us know.

Very truly yours,

A handwritten signature in cursive script that reads "Emory G. Long".

Emory G. Long, Director
Administrative Operations Division

GEJ:dh

TEXAS AIR CONTROL BOARD

PHONE 512/451-5711

8520 SHOAL CREEK BOULEVARD

CHARLES R. BARDEN, P. E.

EXECUTIVE DIRECTOR

AUSTIN, TEXAS - 78758

C. McKEE, Ph.D., P.E.
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JAMES D. ABRAMS, P.E.
FRED HARTMAN
WILLIE L. ULICH, Ph.D., P.E.

January 22, 1974

Mr. James M. Rose, Director
Division of Planning Coordination
Governor's Office
Sam Houston State Office Building
Austin, Texas 78711

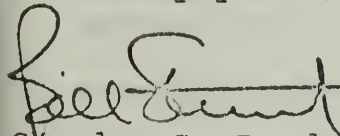
Attn: Mr. Leon Willhite

Dear Mr. Rose:

Our agency has reviewed the draft Environmental Impact Statements for Red Deer Creek Watershed, Gray, Roberts, and Hemphill Counties, Texas, and San Felipe Creek Watershed, Val Verde County, Texas, and we have no comments to offer.

Thank you for your consideration in forwarding these documents to my attention.

Sincerely yours,

 (Div. of Air Quality Operations)

Charles R. Barden, P.E.

Executive Director

Texas Air Control Board



TEXAS STATE SOIL AND WATER CONSERVATION BOARD

1018 First National Building
Temple, Texas 76501
AREA CODE 817. 773-2250
January 24, 1974

Brigadier General James M. Rose
Director, Executive Department
Division of Planning Coordination
Box 12428, Capitol Station
Austin, Texas 78711

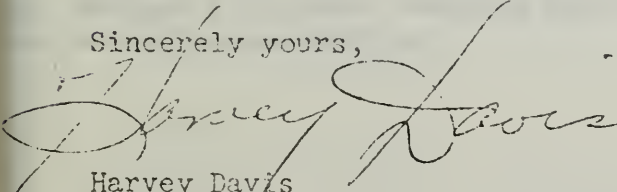
Re: Soil Conservation Service
Environmental Statement and
Work Plan, Red Deer Creek

Dear General Rose:

Thank you for forwarding the above referenced environmental statement for our review and comment.

As the state agency responsible for Public Law 83-566 projects such as Red Deer Creek, we have participated in the development of this work plan. We have also worked with the local sponsors of this project from the date we received their application in May, 1965. In our opinion, the project is needed and worthwhile, and is planned according to the desires of the local sponsors. We believe that the work plan and environmental statement accurately reflect planned and existing conditions in the watershed. Therefore, we offer no adverse comment on these documents.

Sincerely yours,


Harvey Davis
Executive Director

HD:ej



Panhandle Regional Planning Commission

AMARILLO, TEXAS 79105

January 17, 1974

Mr. Edward R. Thomas
State Conservationist
Soil Conservation Service
P.O. Box 648
Temple, Texas 76501

Dear Mr. Thomas:

Please refer to your December 10, 1973, letter which transmitted a copy of the draft environmental statement for the Red Deer Creek Watershed, Texas. The Natural Resources/Environment Committee and the River Basin Technical Committee met in joint session on January 7, 1974, to review the draft environmental statement. The statement was extensively discussed by the members of the two Committees, project sponsors, and interested citizen guests. Members of both Committees unanimously concurred in the following joint statement after completion of all discussion:

"The Natural Resources/Environment Committee and the River Basin Technical Committee of the Panhandle Regional Planning Commission reviewed on January 7, 1974, the draft of the Environmental Statement for the Red Deer Creek Project in Gray, Roberts, and Hemphill Counties, dated October 1973. The draft of the Environmental Statement was unanimously approved by the two Committees. In approving the Environmental Statement, consideration was given to the requirements of Public Law 86-523 and to the potential 1974 archeological survey of the Red Deer Creek Watershed now under negotiation between the U. S. Department of the Interior, National Park Service, and the West Texas State University Anthropology Department."

The full text of the Committees' report of January 7, 1974, to the Chairman of the Panhandle Regional Planning Commission is attached for your information.

The attached Committees' report will be presented to the Board of Directors of the Panhandle Regional Planning Commission on February 13, 1974, for the Directors' review and recommendation.

Sincerely yours,

Robert C. Lord
Regional Engineer

RCL:rm

Enclosure (1)

January 17, 1974

cc: (All w/c enclosure)

Mr. W. W. Nicklaus
Chairman, PRPC

Mr. Hugh LeClair, Chairman
Natural Resources/Environment Committee

Mr. Mike Crawford, Chairman
River Basin Technical Committee

General James Rose
Executive Director
Division of Planning Coordination
Office of the Governor

Judge Don Cain, Gray County

Judge Newton Cox, Roberts County

Judge B. F. Conyers Hemphill County

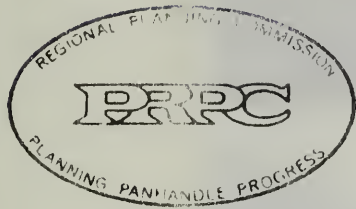
Mr. Curtis Shafer, Gray County SWCD

Mr. J. T. Rogers, Roberts County SWCD

Mr. D. Huston Stickley, Hemphill County SWCD

Mr. Douglass Cunningham
Area Conservationist
Soil Conservation Service

Dr. Jack T. Hughes
Department of Anthropology
West Texas State University



Panhandle Regional Planning Commission

AMARILLO, TEXAS 79105

February 13, 1974

Mr. Edward R. Thomas
State Conservationist
Soil Conservation Service
P.O. Box 648
Temple, Texas 76501

Dear Mr. Thomas:

Please refer to my January 17 letter regarding the draft environmental statement for the Red Deer Creek Watershed, Texas. The Board of Directors of the Panhandle Regional Planning Commission considered, and unanimously endorsed, the draft environmental statement on February 13, 1974. There is attached the pertinent excerpt from the minutes of that meeting.

Sincerely yours,

Robert C. Lord

Robert C. Lord
Regional Engineer

RCL:rm
Enclosure (1)

cc: (all w/c enclosure)

Mr. W. W. Nicklaus
Chairman, PRPC

Mr. Hugh LeClair, Chairman
Natural Resources/Environment Committee

Mr. Mike Crawford, Chairman
River Basin Technical Committee

General James Rose
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Division of Planning Coordination
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Judge Don Cain, Gray County
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Mr. Curtis Shafer, Gray County SWCD
Mr. J. T. Rogers, Roberts County SWCD
Mr. D. Huston Stickley, Hemphill County SWCD

Mr. Douglass Cunningham
Area Conservationist
Soil Conservation Service

Dr. Jack T. Hughes
Department of Anthropology
West Texas State University

At the March 21, 1973, meeting, the General Assembly of the Panhandle Regional Planning Commission endorsed the Red Deer Creek Watershed Work Plan in Gray, Roberts, and Hemphill Counties, Texas, with the comment that provisions be made for archeological studies of dam sites and areas to be inundated, prior to the initiation of construction. Subsequent to that action the project sponsors modified the report to accomodate comments thereon received from other agencies. A draft Environmental Statement, compatible with the modified report, was prepared in October 1973. The Natural Resources/Environmental Committee and the River Basin Technical Committee jointly reviewed and unanimously approved the draft Environmental Statement on January 7, 1974. In approving that draft, consideration was given to the requirements of Public Law 85-523 and to the potential archeological survey of the Red Deer Creek Watershed under negotiation between the U. S. Department of the Interior, National Park Service and the West Texas State University Anthropology Department.

A motion was made by Mr. Joe Bill Barnard to endorse the draft Environmental Statement in accordance with the findings of the Natural Resources/Environment and River Basin Technical Committees. The motion was seconded by Mrs. Pat Waters and carried unanimously.

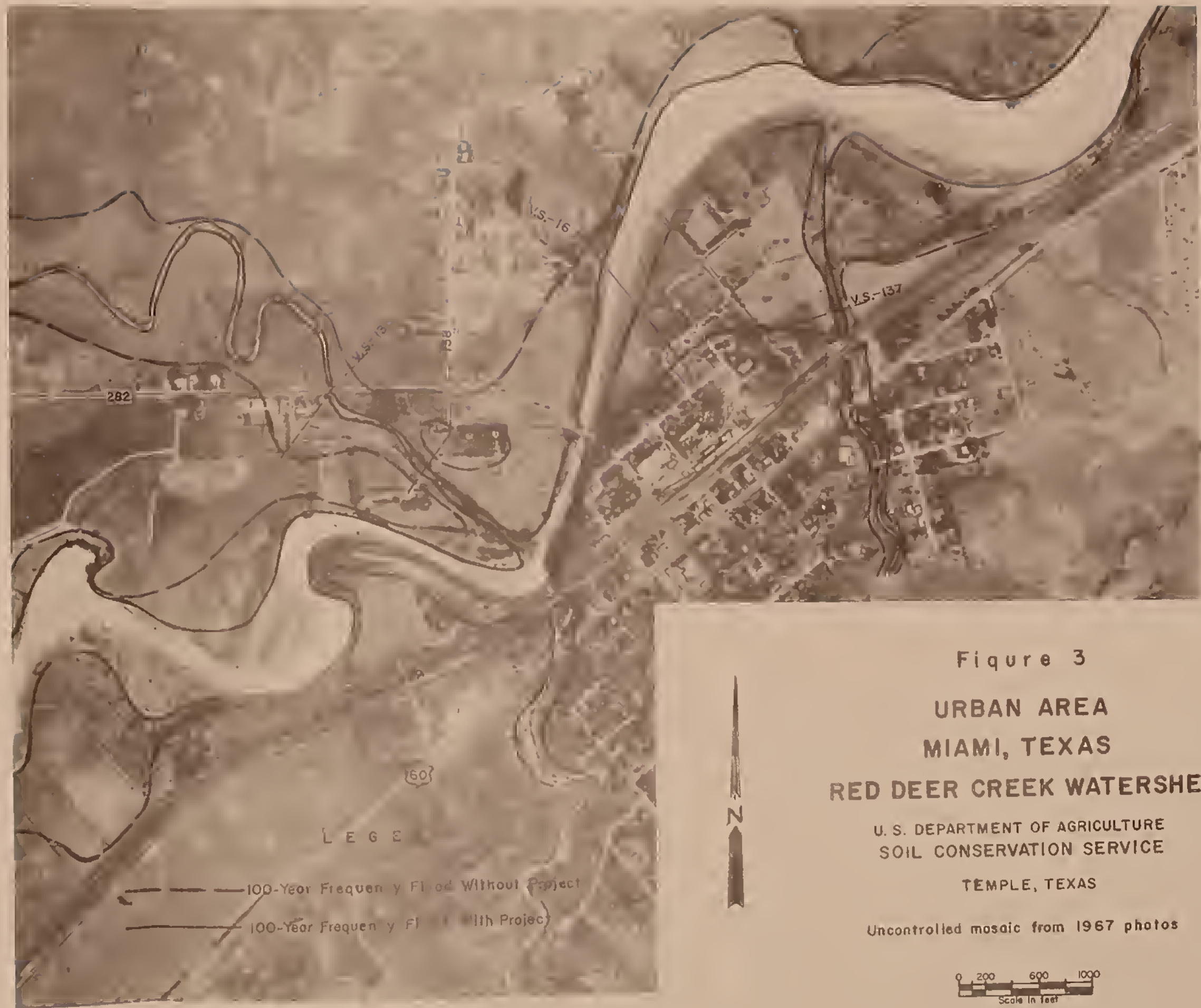


Figure 3
URBAN AREA
MIAMI, TEXAS
RED DEER CREEK WATERSHED

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

TEMPLE, TEXAS

Uncontrolled mosaic from 1967 photos

0 200 600 1000
Scale in feet







